THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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BRITISH TRADE WITH CANADA.

THE rapidity which has characterised the expansion of trade in Canada during the last few years is shown by the fact that since 1902 imports have trebled and exports have increased by 73 per cent. In view of this expansion in the total trade, it might have been expected that British trade would take its fair share, but, unfortunately, this has not been the case. In fact, prior to 1897, when the Canadian Government decided to give preferential Customs treatment to British goods, the volume of imports from the United Kingdom had steadily declined from year to year for a number of years. As a result of the preference, imports from the United Kingdom began to increase, but this increase has not by any means kept pace with the increase in the total trade.

We have repeatedly pointed out in these columns that all was not well with our Canadian trade, and we are again constrained to call attention to the matter by reason of the publication by the Board of Trade of a report by Mr. Hamilton Wickes, H.M. Trade Commissioner in Canada, on the trade of that Dominion. This report, from which we quote at some length elsewhere in this issue, is stated to be a report on the trade of Canada for the year 1912, but in reality it is a careful outline of the general factors bringing about the present position of Canadian trade, with suggestions as to the best way in which the British position in the Dominion can be improved. For this reason we commend it to the careful attention of all British firms who are interested in, or who might become interested in, the Canadian market.

Mr. Wickes has not been in Canada very long, but it is clear from his first report that he is determined to get to the root of the trouble in that Dominion as he did in Australia, and then to bring his findings forcibly to the notice of firms on this side. Our readers should be particularly interested because an analysis of the trade statistics of Canada shows that it is in metals, machines and machinery that our position in the Dominion is worst. Of the total imports into Canada in the year ended March, 1912, the British share was only 22 per cent. as compared with a United States share of 63 per cent., and though the actual volume of the imports into Canada from the United Kingdom has increased yearly during the last few years, the percentage of the total has declined. On the other hand, the United States percentage has increased along with a large increase in the actual volume of American trade with the Dominion. As Mr. Wickes points out, the decline in the proportion of imports from the United Kingdom, which has been gradual and consistent, is a serious matter. The trade so lost has not been divided between a number of other countries, but has been almost entirely absorbed by the United States, as the figures of imports from that country show. The resultant strength of the United States position in Canada may be judged by the fact that the total of single items of trade in which the United States share exceeds 75 per cent., represents a trade of $274,754,000, or nearly 53 per cent. of the imports of all classes of goods.

The most important section of our business with Canada is the dry goods trade, in which our position is very satisfactory, the British share of the total being over 65 per cent. As we show above, our percentage of the total trade is only 22 per cent., so that just as in the dry goods trade our position is much better than the total figure would lead one to expect, so in other sections, and notably in the metal and machinery section, is our position much worse. Calculations which have been specially made show that if we eliminate the trade in dry goods from the total trade, our share of the remainder is only 15 per cent. And, as a matter of fact, our actual share of the trade in metals and machinery is only 14 per cent. This is an extremely poor showing, which it ought to be possible to improve. Undoubtedly American firms have a great advantage over us in trade with Canada. In the first place, Canadian tastes are very similar to American tastes, and American methods of doing business would, in most cases, appeal to the Canadian mind. Again, a very large number of engineers in Canada are either of American nationality or have been trained on American soil, a fact which naturally influences business in favour of United States firms.

These are more or less abstract advantages, but there are other, what we may call concrete, advantages, which vitally affect our trade with Canada, and notably the trade in goods of interest to readers of the ELECTRICAL REVIEW. Some months ago we were able to print in full a report by Mr. Hamilton Wickes on the operations of the Chicago Underwriters' Laboratory, which showed how great a handicap these operations proved to the extension of British trade in electrical goods in Canada. Mr. Hamilton Wickes, in the report with which we are now dealing, again refers to this matter in the following terms :—

This institution (*i.e.*, the Chicago Underwriters' Laboratory) owes its inception to the fire insurance companies, British and American, who, in face of the appalling losses from fire in North America (many of them felt to be due to the use of improper material) provided the funds and staff for a testing laboratory in Chicago. Speaking generally, these fire insurance companies will not insure a building unless samples of the articles, appliances or material affecting the fire hazard to be used, have first been tested, and the bulk subsequently manufactured under the supervision of inspecting officers of the Laboratory, who affix a transfer, label, or tab indicating that such material, device, &c., has been tested and passed by the Laboratory's inspector. The operation of the Underwriters' Laboratory Corporation, so far as British trade is concerned, is, in practice, to shut them out from a very considerable business. British goods are not refused—in fact, British firms are invited to send material, appliances, &c., to the Laboratory to be tested. But that the article has simply been tested is not sufficient, and there are no inspectors in England to see that the bulk manufactured at the factory is similar to the sample, and to affix the necessary Laboratory label, or tab, or transfer.

It has been recommended that some similar institution should be started in this country with the object of removing a grievous disability under which British manufacturers in the electrical trade labour in attempting to do business with Canada, and we believe that the matter has received full consideration at the hands of some of our representative industrial leaders. Whether, sooner or later, anything will be done along the lines suggested, we cannot say, but our readers will have observed in our last issue an announcement of the appointment of Messrs. Heap & Digby, of Westminster, with authority to approve British manufactures, on the Underwriters' behalf, before they leave the factory.

Our Canadian correspondent advises us that this appointment has been made as the direct outcome of the recommendations of Mr. Hamilton Wickes, and on account of the wishes of a number of English electrical exporters. Our correspondent adds : "Thus is opened yet another path whereby the entry of British goods into this country is facilitated, the other one being that recently mentioned in these pages as applicable to Ontario, viz., the approval of the Hydro-Electric Power Commission."

We trust that this new arrangement will be followed by that advance in our electrical exports for which we all hope.

Another concrete advantage which American firms have over British is the cheapness with which they can deliver owing to their proximity to the market. This is another factor which particularly affects trades like the electrical and machinery trades. We noticed above that our share of the total trade in metals and machinery was 14 per cent. ; further calculations made by Mr. Wickes show that in lines which may be called "simple forms of metal manufacture" our share is 22 per cent., whereas, in "machinery and finished articles" our share is only 9¾ per cent. Leaving out of account for the moment American enterprise, the adoption of American standards and similar factors contributing to American success in Canada, there can be no doubt that an important reason for our low share in the trade in machinery is the wide difference in freight rates from this country and from the States, and the larger cost of packing entailed here by our distance from the market ; in this connection it will be noticed that in "simple forms of metal manufacture," for which freights, comparatively speaking, are low, our position is much better.

In spite of our rivals' advantages there is no doubt that our position could be much improved if the will to do it were there, and as Mr. Hamilton Wickes points out, it is only by recognising the natural advantages which American firms enjoy that British manufacturers and merchants, desiring to open up or to extend business in Canada, can properly appreciate the difficulties they have to meet and overcome, and can realise how necessary it is that they should avoid handicapping themselves in other ways. The report now before us shows how best firms may approach the market, and what mistakes they should avoid. In future reports we hope that Mr. Hamilton Wickes will deal at greater length with specific trades, and from certain remarks made in this report we gather that this is his intention. Judging by the careful analysis of the general trade position which he has already made, he has obviously set himself a big task, but it is a task which ought to be performed in the interests of British trade in the Dominion. Meanwhile, the work which this report must have entailed should have given a sound basis for further investigations, and the results already set out will certainly be helpful to firms interested in the market pending the further and more specific information which should soon be forthcoming.

In Camera.

ON Friday last, at the express invitation of the Hon. Secretary of the I.M.E.A., we attended the adjourned meeting of the Association held to discuss the model general conditions of contract drafted by the B.E.A.M.A. The invitation contained the following paragraphs, drafted, we understand, after consultation with the Hon. Solicitor :—

"In view of the fact that some of the speakers may, to explain their views upon contract conditions, speak somewhat pointedly as to their experiences—I should only like to suggest that a considerable amount of discretion should be exercised by your reporters in quoting their remarks."

"I consider it quite sufficient to make this suggestion to you, rather than that the Association should ask you not to report the meeting."

When the proceedings began it was almost immediately apparent that there would be some opposition to the presence of outsiders at the meeting, and Ald. Bruce, of Sunderland, moved a resolution that this meeting, as was the case with the previous one, should be held *in camera*.

The hon. secretary, Mr. Faraday Proctor, offered good and sufficient reasons for allowing the representatives of the Press to remain, and was supported by Mr. J. E. Edgcumbe, the president who has just retired. The meeting, however, by a large majority decided to hold the meeting *in camera*, thus ignoring the official invitations issued by the secretary.

While it is obviously within the assumed powers of the Association—despite the fact that it represents *public* not private undertakings—to hold secret conclaves, the procedure followed in this instance (and previously) as far as the Press is concerned, was a direct slight to the latter, and an unwelcome reminder of some municipal methods of bygone days.

Moreover, it would reasonably appear to be in the interests of the Association, that the Press, after being invited, should be allowed to form its opinion on the merits of the case, even though no details were published.

A Keighley Report.

AMONG the numerous annual reports on electricity undertakings which have reached us, one of the most interesting is that of Mr. Harry Webber, the Keighley borough electrical engineer. It gives one an insight into the difficulties encountered, the past progress and the future prospects of his undertaking, which is more than we can say for the general run of such documents.

It is only within the last few years that the Keighley undertaking commenced to hustle, and now it would appear to be making such rapid headway that the Council has some difficulty in keeping pace with its development.

This is primarily due to the adoption of modern generating plant and the cultivation of the local power load—a procedure which sounds easier than it really is when a start has to be made with an out-of-date works and an annual deficit.

At any rate, the policy, which Mr. Webber sums up as one of "small profits and quick returns," has resulted in increasing the output of units sold by 50 per cent. in one year. Forty-one agreements—13 for H.T. supply—have been entered into with local mills and engineering shops for periods of five years and upwards, and under the terms arranged the department is guaranteed an annual sum of £4,300. These accounts are paid monthly, not quarterly, an arrangement which provides the department with a regular supply of money, which is available for the settlement of current accounts.

With a power load of 3,000 H.P., and a summer peak load considerably in excess of the previous winter's peak, Mr. Webber naturally looks ahead. He anticipates at least twice the present power load during the next two or three years, but a further paragraph, which states that he considers "there is about 20,000 H.P. of industrial work done within easy radius of the power station which will yet be catered for by the Corporation, if they will only provide efficient plant and mains . . . .," indicates more clearly his idea of the future of the Keighley undertaking. The population being under 50,000, the lighting units sold were less than a quarter of a million last year, while motors absorbed 2½ million units, these two supplies giving an average revenue of ·86d. per unit; the total output sold was just over three million units, and the total revenue under 1d. per unit.

Against these low figures must be placed extremely low working costs—·39d. per unit for generation and distribution, and total works costs of just over ½d. These results fully justify the policy which has been adopted, and should materially influence the Council in favour of Mr. Webber's proposals for future development, not only in the matter of local power supply, but also in connection with supply to adjoining local authorities.

The Motor-'Bus Question.

WE have received from Mr. T. B. Goodyer, tramways manager to the Corporation of Croydon, a copy of a circular which he has distributed to Members of Parliament and to the local authorities of the Metropolis, and in which attention is drawn to the urgent need of legislation to place the motor-omnibus companies on terms of equality in respect of public obligations with the municipal tramway authorities in the Metropolitan area. Mr. Goodyer states that practically every municipal tramway undertaking in that area will have to be assisted from the rates next year, and illustrates his remarks by an extract from his annual report, showing that while the Croydon tramways last year contributed more than £11,000 to the local revenue, mainly by way of rates on track and maintenance of the roads, the omnibuses have paid practically nothing into the local treasury.

We are bound to sympathise with Mr. Goodyer's attitude. It is true that the 'buses are free from the manifold restrictions and burdens imposed upon the tramway undertakings; the only tax of any importance that they have to pay is the petrol tax. The tramways cannot be laid without the sanction of Parliament—the 'bus can go anywhere; the tramcar has to pave and maintain the roadway which is used by its rival, besides maintaining its own expensive track; the car has to carry workmen at fares far below cost—the 'bus pays no such subsidy; and the car pays rates on the track.

We are emphatically of opinion that tramway undertakings ought not to be called upon to maintain the roadway, which they do not wear out, and, on the other hand, that if the tramways cannot be relieved of the heavy burden of workmen's fares, the motor-'buses should be compelled to share that burden with them. The present state of affairs is intolerable.

We are not advocates of the municipal control of trading concerns, but we are advocates of fair play; and in view of the enormous capital invested in tramway undertakings, whether municipally or privately owned, we consider that the unjust handicap imposed upon them by Parliament ought to be removed so as to give them a fair chance in competition with their young rivals. It is ridiculous to say, as the *Daily Mail* has said, that the tramways are a failure—when they have not had a fair chance. It would be as reasonable to pit an athlete, laden with a 20-lb. weight, against a racer running light, and to say that the former was beaten on his merits.

Electrical Accidents.

ELSEWHERE in this issue we conclude the report of Mr. G. Scott Ram, H.M. Electrical Inspector of Factories, on the accidents which occurred in electrical works in 1912. Mr. Ram's report is always interesting, and this year we have reproduced it almost *in extenso*.

As usual, many of the accidents were due to the negligence or inadvertence of skilled men, who were perfectly acquainted with the nature and extent of the dangers amongst which they were working. It is impossible entirely to eliminate this class of accident; risks must be taken in almost every branch of engineering, and they are daily faced by our engineers with a cool daring which at times verges on foolhardiness. Unfortunately, there is still no effective means of distinguishing the live wire or switch from harmless, uncharged metal; various detectors have been invented, but in practice they are seldom used, even in the rare event of their being at hand. Some automatic device is badly needed, similar to the paint which changes colour when it is heated, so that live metal could be distinguished at a glance. Perhaps such a device will one day be forthcoming.

Far too many accidents are due, year after year, to the careless or improper use of portable apparatus supplied through flexible conductors. The Home Office has done its best to guard against such accidents, but it is clearly impossible to prevent occasional infraction of the rules, and the only course that appears to offer any prospect of improvement is the rigorous prosecution of the responsible authorities whenever the breach can be brought home to them. The convenience, which is so valuable a characteristic of electricity, carries with it the inherent liability to abuse on the part of ignorant or careless users, and the penalty, unfortunately, is too often a heavy one indeed. Frequent and regular inspection of *all* electrical apparatus ought to be an imperative rule in every workshop where motors and portable apparatus are employed.

Failing the prevention of accidents, the next best thing is to mitigate their consequences as far as possible. As Dr. Reginald Morton has pointed out, death from electrical shock is only an apparent death at first, and there is almost always a period, long or short, during which it is possible to resuscitate the victim by immediate recourse to artificial respiration. We are pleased to notice that Mr. Ram, in his report, recognises the efforts that we have made for nearly 20 years to acquaint electrical engineers with the most effective measures to be taken in case of shock; there are few central stations in this country where our "Shock Sheet" is not to be seen on one of the walls. But the mere presence of the instructions is useless—they must be studied beforehand, for when the need arises for their application it is already too late to begin their perusal. We therefore earnestly commend to the notice of station engineers the remarks of Mr. Ram, urging them to see that the staff are properly drilled in the methods of artificial respiration and able to apply them at a moment's notice. The matter is truly a question of life or death.

TRAMCAR GEAR-WHEELS AND PINIONS.

TRAMWAY engineers have been long interested in systems of hardening by which the life of pinions and gears is prolonged. Hitherto, however, all tempering has been confined to the pinion, but the drawback urged against case hardening, which is the method mostly known in this country, is that a somewhat poor quality of steel has been necessary in order readily to take the process, and as soon as the thin skin is worn through a soft material is reached, which has no wearing capacity. Many attempts have been made to apply the same process to the gears, but these have been only partially successful by reason of the distortion which is set up when a somewhat large mass is submitted to special tempering. Oil tempering has been used with considerable success on the pinion, but this again has been only partially successful when applied to the gear.

It is clear that on account of the severe conditions met with on many tramways and railways, the prolongation of the life of a gear-wheel and pinion is a desideratum of the first importance.

Curiously enough, the life of a gear varies at times in a most unexpected manner. It could be fairly assumed that a hilly district would lead to an abnormal wear on the surface of the teeth, but in some of the hilliest districts in this

FIG. 1.

country it has been found that the life has been somewhat beyond the normal. On the other hand, on systems where there are practically no gradients, the life has been in some cases unusually short, which shows that there are other causes of wear at work besides the gradients. It is usually found, however, that gear-wheels and pinions have the shortest life in hilly districts.

One of the most remarkable developments in tramway work which we have investigated for some time is the tool steel process, under which wheels and pinions are treated to ensure an abnormally long life as compared with ordinary materials.

Clearly, to prevent wear, the treatment must have for its object a hardening, but the drawback hitherto urged against any such process is that it only hardens the skin, and to obtain this a quality of steel is employed which in itself may be abnormally soft. The process now to be described is one which converts the wearing portion into tempered tool steel. The noteworthy feature is the depth to which the treatment extends. It would appear that this can be made entirely to suit the wearing condition, and in the case of an ordinary three-pitch pinion, which is the one most commonly used on English tramways, the depth of hardening or tempering (whichever the correct term may be) is something over one-eighth of an inch, and this actually corresponds to the wearing limits of the pinion. In the case of $2\frac{1}{2}$ and 2-pitch, the depth is increased to the degree of wearing. It is important to note that the steel which is treated in this way is specially cut from material which will stand the strains involved in the treatment. To make this clear it may be mentioned that objections are sometimes urged against a hardening treatment in that the steel is liable to be distorted during the process, but in the case of the material under discussion it is entirely obviated by the use of a special quality of steel. In connection with this system it is to be carefully borne in mind that, unlike all other methods of hardening, the process is applied to the gear-wheel equally with the pinion. Hitherto, hardening has been confined to the pinion, and it, therefore, follows that if the gear can be treated to the same degree of hardening, a condition of things is obtained which is new and promises at the same time to give a life that has been previously unknown.

The inventors of the process experimented for seven years before arriving at a satisfactory result, and though the process is only gradually coming into use in this country the products manufactured under the system mentioned have been in use on the majority of American tramway systems for more than six years. In fig. 1 is shown an example of a wheel and pinion after a long service. These gear-wheels were put into service on May 12th, 1909, and on September 23rd, 1911, were actually in the condition shown in the illustration after running 124,685 miles. The value of the record is shown by the fact that the wheel had worn at the pitch line only 6 per cent., while the pinion had worn 43 per cent. of the allowable wear. It may be urged that this is an exceedingly good case, and to meet this objection a second illustration (fig. 2) is given, showing the com-

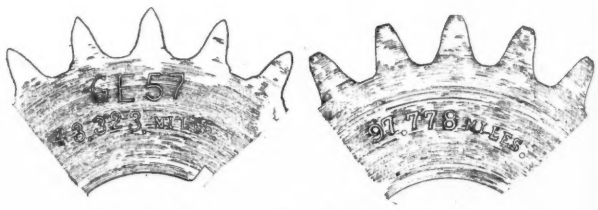


FIG. 2.

parison between a tool-steel pinion and an oil-tempered pinion operating on the same tramway. These were obtained from actual rubbings at the end of each pinion ; it will be noted that while the oil-tempered pinion after 43,323 miles is worn to a knife edge, the tool-steel pinion after 97,778 miles is less than half worn out.

As a further proof of the value of the process, and one which places the records upon the highest possible plane, a series of tests may be taken which was instituted by a large traction company to try and settle the question of gear-wheels and pinions. It equipped 18 double-truck cars with three different grades of gear-wheels, and 13 grades of pinions bought from the six largest gearing manufacturers in the world. There were three grades of materials tested : the ordinary soft pinions and gears, oil-tempered pinions and the tool-steel gears and pinions. There was a certain degree of variation even in the same material, but it is easy to strike an average. To arrive at something like a definite figure of merit, careful measurements were made to show the mileage obtained with a certain definite wear. The figure taken was one-thousandth of an inch wear at the pitch line. The average for untreated pinions was about 140 miles, and for specially treated material 160 miles, while the pinions manufactured under the process now described gave 1,220 miles. The same story can be told in regard to gear-wheels. Untreated wheels ran about 540 miles per thousandth of an inch wear, but tool-steel gears ran 4,696. Such figures incontestably prove the value of the material, and it is clear that from the £ s. d. point of view, which, after all, is the all-important one, it would be worth while paying enhanced prices to obtain such results. There are scores of similar records, but it is not necessary to reproduce them ; the whole point is that the tool-steel material, from the indisputable evidence put forward, should give about five or six times the life of ordinary gear-wheels and pinions, and that alone should be sufficient to arrest the attention of tramway authorities.

The photographs which we reproduce of sections of the gearing clearly demonstrate the depth of hardening. It may be

mentioned that figs. 3 and 4 are reproduced from untouched photographs, and show very clearly the actual wearing depth. The peculiar grained appearance is, of course, due to filing. It should be understood, however, that this

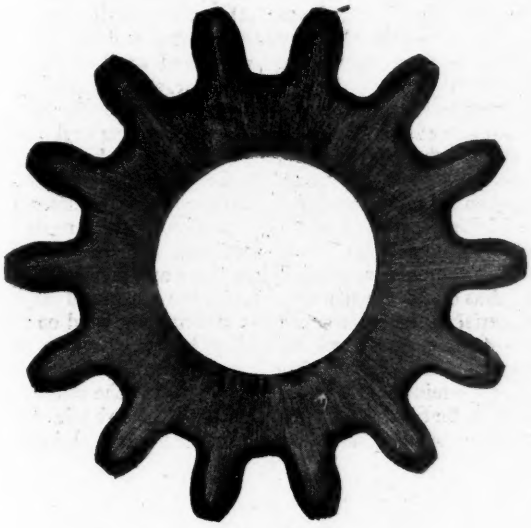


FIG. 3.

section of a pinion has undergone precisely the same process as is applied to ordinary pinions and gear-wheels. The point has been raised as to whether this degree of hardening makes the metal brittle. Clearly, if that were the case,

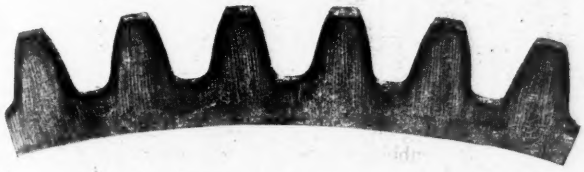


FIG. 4.

much of the value of the material would be discounted, but under the hardest service the gear-wheels and pinions manufactured under the tool-steel system have never been known to break.

FURTHER PROGRESS IN THE DEVELOPMENT OF THE ELECTRIC VEHICLE BUSINESS IN AMERICA.

BY DOUGLAS SUTHERLAND MARTIN.

(*Concluded from page* 47.)

As a further instance, we must make at least some mention of the garage question—a matter which has presented the vehicle people with a host of difficulties, and which is still far from settlement. There is no doubt that in many cities in this country the lack of adequate facilities for charging is militating very seriously against the further adoption of the electric by the residents and merchants of these cities; but it would be difficult to cite any instance of a town where some genuine effort has not been made to line up the various electrical interests, and to see how this lack of charging stations can be made up. A few weeks ago Mr. W. C. Anderson, the president of the Anderson Electric Car Co., met the managers of the New York Edison Co. (the power supply company) in a discussion which resulted in the decision to appropriate $30,000 for the establishment of an all-electric garage in New York City. This appropriation will be expended at the rate of $10,000 a year toward the rental and promotion of an electric charging station where any owner of an electric can be assured of expert attention; and, so far as New York is concerned, this will go far towards removing one of the chief obstacles which the vehicle salesman has encountered in his canvassing calls upon the down-town merchants.

Or again, we may cite another example from Boston. Last fall the Electric Motor-Car Club in that city issued a booklet giving the names and addresses of all the principal charging stations in Massachusetts, some 70 municipalities being covered by the list, which included 105 charging points, 75 establishments where batteries might be charged at any hour of the day or night, and 15 places giving emergency service only. It is hardly necessary to dilate on the value which would attach to such a publication in the mind of the owner of an electric, if he were planning a week-end jaunt from, say, Boston to Pittsfield and back; while it is easy to see that, if you were canvassing a man in Springfield or any point midway between these cities, with a view to convincing him that the electric was just the thing he wanted, your task would be considerably simplified if you could prove to him that he was never going to be landed on a dark night miles out of the reach of any electrical service.

It is the same thing in Chicago, and, indeed, in all of the big cities. "The need of a large down-town garage was conceded by all. One speaker remarked that there were often 900 electric vehicles standing at one time on the down-town streets of Chicago. One large garage could be used for the storage of pleasure vehicles during the daytime, and for the charging of commercial vehicles at night. A Committee was appointed to arrange for a joint meeting with the Garage Owners' Association, at which this subject could be discussed further." Is there any need to add anything by way of comment on the nature of the difficulty, and the inevitable necessity for this "get-together" attitude in overcoming it?

Just one more—this time from St. Louis. Early in 1906, when there were but 11 electric vehicles in St. Louis, and a woeful lack of expert and intelligent attention to the subject, the central-station company began an aggressive educational campaign, which included the opening of garages and taking the local representation for some well-known types of pleasure and commercial cars. Largely as the result of this policy, the use of the electric vehicle in St. Louis has expanded very rapidly, until to-day (end of January, 1913) there are more than 700 electrics in operation on the streets of that city. Does the lighting company, in these circumstances, decide to reap some of the harvest from the seed which itself has sown, gathering in the fat season something of the first fruits which should, by all justice, accrue to it, in payment for its pioneering and trust service during the period of leanness? No; but it decides that the time has now arrived when it should withdraw from active competition with others in selling and garaging. It has, therefore, given up its agencies and will close its public garage as soon as its customers can be accommodated elsewhere. The charging stations will now pass into private hands; while the larger makers of vehicles will themselves come in and see that their product is duly displayed before the merchants of the city. That is a pretty broad-minded sort of policy; and the result will be a big increase in the sales of electrics in St. Louis, as well as the fostering of just the right spirit of co-operation between the garage, central station, and manufacturer. They all stand to gain by co-operation, and they know it.

That the electric vehicle men of America are now taking a very broad view of the road transportation question, and that they have implicit faith in the ability of their vehicle to make good on its own merits, is shown in their willingness to concede a place in the sun to the gasolene vehicle. Up till within quite a recent time the boosters of the electric seemed to imagine that they could not conscientiously concede any points of merit to any vehicle except their own, in spite of the marvellous engineering progress which had been made in the gasolene engine, and in spite of all kinds of evidence that, for many classes of service, commercial as well as pleasure, the latter was enormously superior to any electric car which was available, or which was likely to be available for a very long time.

This, of course, was an exceedingly narrow view to take, and could never redound to the credit or profit of the

electrical interests responsible for its advocacy. Fortunately, it was not persisted in, and it has now been supplanted by a much broader policy. At recent meetings in this country the field of the gasolene vehicle has been clearly defined, and the electrical men are no longer blinking the fact that at present they stand to gain nothing from engaging in any competition with the gasolene people in services involving runs of over, say, 40 miles with infrequent stops. Future progress in the manufacture of electric vehicles and equipment, and normal advances in the central-station art whereby the provision of charging stations will be on a much more extensive scale than it is at present, may in course of time provide a realisation of the dreams of those who predict a complete usurpation by the electric of the place now held by the gasolene car, for pleasure touring as well as for all kinds of commercial delivery. But at present that time has unquestionably not yet arrived, and it were wiser for the electric people to confine the best of their energies to the urban districts, where the strength of their position is overwhelming. It is very interesting to note the latest departure of the General Vehicle Co. For many years they have held the leading position in the manufacture of all kinds of electric delivery trucks, and have acquired a substantial reputation for the quality of their product. In many instances, after having filled the orders of a given commercial house for a fleet of electric vehicles, they have been compelled to stand by and watch their customer go elsewhere for the supply of a few gasolene vehicles, to take care of the longer hauls and to bring up the whole of his road transportation equipment to the point of maximum efficiency. After standing off for some years and studying the engineering of the matter very closely, the General Vehicle Co. have been, of course, driven to the conclusion that there is a logical reason for this, that there is a field for the gasolene vehicle which, at any rate for the present, cannot be filled by the electric, and that, to administer to the wants of the market adequately, they must be prepared to supply the best kind of wagon for any condition of service, irrespective of whether it is an electric or a gasolene machine. They are, therefore, now embarked on a policy which frankly admits the superiority of the combustion engine for the longer hauls, and which, indeed, is established on the principle that the horse can only be driven from the streets by a frank admission of the relative fields of the two types of self-propelled truck, and an intelligent application of the known facts in regard to the operation of each. They are now marketing the Mercedes gasolene truck in this country, and in a short time will have a factory of their own in regular operation, for the building of Mercedes trucks in accordance with the German drawings.

ELECTRIC POWER FOR LOADING AND STACKING COAL.

One of the great difficulties in handling large quantities of coal, ore or other loose material, is the necessity for storage at convenient points. Obviously, it is impossible so to regulate supply and demand that there shall not be any point between the pit mouth or the mine, and the customer, at which an accumulation occurs, and as the cost of the delivered product depends very largely on the labour charges and transport costs, it is evidently a matter of very great importance that the problem of stacking coal or other minerals should be very carefully considered. In a good many schemes which have been devised for this purpose, the mechanical arrangements are all that could be desired, but the initial cost of preparing the ground and erecting the plant represents an important charge per ton of material handled in order to meet depreciation and increased interest on first cost. On the other hand, the storing of any loose material in the ordinary way by stacking by hand on unprepared ground represents a very heavy cost per ton in hand labour. The problem is a very real one, because not only the mine and the customer, but also the railway companies, find it necessary to store loose material in bulk in large or small quantities at various times and in various places. This material will probably be brought by truck or wagon and stacked by hand, and when the time comes for its removal, it is again replaced in trucks by hand. Anyone familiar with railway and dock work will know what this entails. It may add anything from 4d. to 1s., according to circumstances, to the cost of every ton handled, and this is an absolutely waste expense.

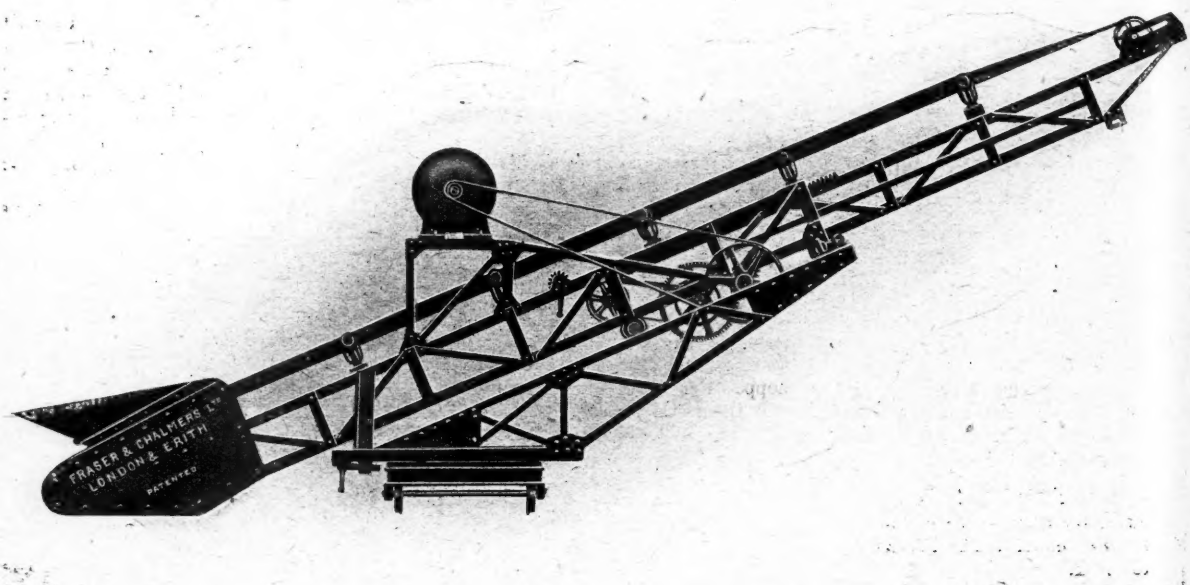


Fig. 1.—Electric Stacking and Loading Machine

A simple apparatus, however, which is shown in the illustration, and is known as Mitchell's stacker and loader, has been developed by Messrs. Fraser & Chalmers, Ltd., of London, to meet the case, and it is claimed that it saves from 80 to 90 per cent. of hand labour costs upon this class of work. It is a very simple machine that can be handled by the roughest unskilled labour, and requires very little power. In construction it consists of an ordinary belt conveyor mounted in such a way that it can be extended in either direction, revolved to any position in plan, racked to any angle of inclination, and wheeled along to any required position. Its flexibility is, therefore, practically complete, and within the limits of its power capacity it performs most valuable work. The telescopic movement is effected by an ordinary rack and pinion, and the changing of the inclination is also effected by rack and pinion. The revolving of the machine around the centre pin can be easily performed

by one man, and one man can also wheel the whole arrangement along the track provided. The driving of the conveyor belt is performed, as shown in the illustration, by an electric motor centrally mounted; the belting has a capacity of 200 tons per hour, and will take material of any size.

In order to illustrate how adaptable this simple machine is to stacking and loading purposes, figs. 2 and 3 show the position of the conveyor when stacking from the truck and when loading a truck from the store pile respectively. In fig. 3 the dotted lines show the fully extended position of the conveyor. When used as a stacker, the receiving hopper is placed closely adjacent to the door of the truck, and the discharging end is extended as required. The material to be stacked is then raked from the truck to the hopper, from which it is conveyed to the heap by the belt. Tracks can be placed parallel to one another at regular intervals, so that a continuous heap can thus be formed. When used as a loader the machine is simply turned round and the hopper is allowed to bear against the heap. All the material above the level of the hopper is then raked down into it, and all below (about 2 ft.) is shovelled into it.

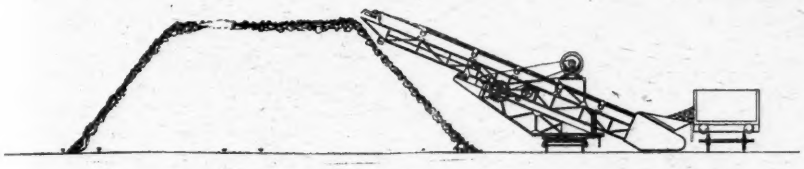


FIG. 2.

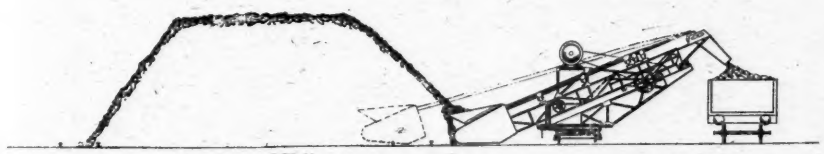


FIG. 3.

As the heap recedes, the conveyor extends automatically by its own weight, so that the hopper is always kept tight against the heap. The only material that has to be shovelled is that actually below the hopper level, and the work on this small quantity represents only the actual filling of the baskets in the old method, the carrying and lifting being saved. The cost of upkeep and depreciation is less than on the number of baskets required to do the same amount of work manually. The largest lump that can be handled by a loader having a 30-in. belt is 15 in. cube. The capacity of this belt is 4,200 cubic feet per hour. The loader has a length of 30 ft. minimum and 40 ft. extended, the height of the discharge point varying from 14 ft. to 18 ft. above ground level. In this way it is easy to deal with the standard 10-ton trucks, even when the boom is closed, and the motor required to drive the machine of this size is only 3 H.P. It is therefore a particularly valuable piece of portable equipment and should meet with a considerable amount of favour.

NOTES FROM INDIA.

[FROM OUR SPECIAL CORRESPONDENT.]

AN important announcement has been made by the United Provinces Government inviting applications for licences for the supply of electrical energy, in accordance with the provisions of the Indian Electricity Act of 1910, within the municipalities of Allahabad, Lucknow and Bareilly. Firms desiring to get further information should apply to the Secretary to the Government P.W.D. Buildings and Roads Branch, Naini Tal., U.P. On receipt of *bonâ fide* applications, and a deposit of £5, copies of the reports by the Government Electrical Inspector, showing probable expenditure and estimated profits on each scheme may be had.

Probably several home firms through their representatives in India will make application for licences. With careful handling and sufficient guarantees from Government, the schemes might be made to pay. In such cases as Nagpur, Lahore and Dacca, where the undertakers made hard bargains with Government by getting them to guarantee a sufficient consumption for Government purposes alone to pay all standing charges, success is almost assured from the start. Firms interested in these concessions should go cautiously to work and obtain all local information possible so as to check the Electrical Inspector's reports, and ascertain on what grounds he bases his figures, and what actual experience he has had with similar undertakings to justify the probabilities of his estimates of expenditure and income being fairly correct. Cawnpore, which is a big industrial centre, has not yet shown any very startling results by way of income to its Electric Supply Co. Lucknow, the biggest city in the United Provinces has, as was recently remarked, been considering a scheme for years back, and its municipality seems afraid to go ahead on its own, but must needs invite outsiders to take the risks.

The Madras Electrical Supply Co. are again this season advertising for sale 2,000 electric fans at cost rate. If these are the same fans which were advertised last season the Madras consumer must be very unappreciative or suspicious; if they are a fresh supply from home it would be more to the point if the supply company kept to its legitimate work of supplying current instead of infringing in the domain of the contractor.

On Sending Catalogues Abroad.—Many very excellent catalogues of English manufacturers and much postage are simply wasted by firms at home in sending their catalogues and advertising lists to firms in India without giving the matter much thought. A director or business manager gives an order to send catalogues of his firm's specialities to, say, all the engineering firms in India which are listed in the "Universal Electrical Directory"; the order is carried out after much trouble, and no little expense, and hopes are built up on volumes of orders following in due course. The catalogues are delivered at this side, the outside wrapping being mostly in a very bedraggled condition; they are looked at very often with eagerness, are equally often admired, and almost invariably shelved or "put aside for future reference." It would appear that there should be some strange reason for this apparent want of appreciation of a good thing: there is a reason, but it is not strange. The secret of the seeming indifference is that in some instances catalogues only give "prices on application," in other instances prices are listed but no discounts are given. As discounts vary from 75 per cent. off lists for Birmingham screws, to, at any rate, 10 per cent. as a minimum on most things, one can at once see the uselessness of a catalogue, no matter how well produced it may be—and some of them are works of art—without prices, and especially without discounts. In a country like India, of, as yet, comparatively few engineering houses, and especially where trade is increasing by leaps and bounds, and, consequently, engineering wants are many and multifarious, an engineering firm, well equipped with all sorts of catalogues well priced, can do all sorts of business. It does not pay to be a specialist in one line only in India; no firm can pay its way by selling, let us say, motors and dynamos only. This is evidenced by the fact that half a dozen of the big engineering firms in Bombay, Calcutta, Madras or Rangoon can supply you with a railway engine or a turbo-alternator as well as insure your life or your motor-car, or, for that matter, book your passage, or send home your Christmas presents. This being so, it is necessary for any progressive firm to have a multitude of catalogues, and, in order to make the best use of them, to have them well priced and arranged for easy reference. Home firms seem a bit conservative about giving away prices, "except on application"; this can be understood of firms bound down to agencies

here, but it is the firms who are not represented by agents here that seem to catalogue and circularise most lavishly. These notes are not intended for firms who have agents here, they are able to look after themselves; they are rather intended for the firms who seem to have good useful saleable articles, but who do not go the right way about pushing them in India.

The primary necessity of sterling business is, first of all to have a genuine article, be it an engine, or a motor, or a switch, so that having sold one, its excellence and usefulness will bring repeat orders—if this happens at home it will happen in India. The next best thing is to sell at a fair, not a fancy, price—the pagoda tree has been well shaken in India by now, and very few Rajahs are left who have not a keen eye on price—give the middleman who can influence customers a margin for also a fair profit. The next important point is time of delivery from the date of receipt of order in England; and having given a stated time it should be adhered to scrupulously. A reputation for prompt delivery to promise, is a tremendous asset to a home firm. The worries and tribulations of an agent who has to go on from week to week or from mail to mail for perhaps three solid months, hoping, promising, inventing, apologising, fearing cancellation of orders and so on, are indescribable.

Another important point to be observed is that catalogues should not be sent broadcast to India. All sorts of native firms with high sounding names get themselves into directories, and again all sorts of requests for catalogues are sent home by private natives who want pretty picture books cheap. The reputable firms are easily located; the amateur inquirer or others can be politely but firmly put off by referring him to any well-known firm who is recorded as having received a copy of the catalogue (with prices and discounts) asked for. Firms who are known to be in the habit of sending their catalogues broadcast all over the country are not at all popular with the local firm here, whose legitimate preserve is being trespassed upon.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Supply Authorities' Regulations.

The article, "Notes for Installation Inspectors," by "Element," in the current issue of your paper, raises the interesting question as to what the position of the various supply authorities is in connection with the enforcement of their rules and regulations.

In conversation with the chief engineer of a large City undertaking, I mentioned to him that I thought it was curious he did not insist on screwed tubing and absolutely refuse to connect any work carried out on the slip-joint system. He replied, that although he drew up a set of rules and regulations, he had absolutely no authority to enforce them so long as the insulation resistance came out at a reasonable figure, but they certainly proved useful, as in a number of cases he was able to enforce them by bluff.

The only desire of the average engineer is to carry through each of his jobs in a thoroughly satisfactory manner, so that absolute safety is ensured both from fire and life, but when one comes up against an inspector with a bee in his bonnet—unfortunately they are far too numerous—it is difficult to know exactly what position to take up.

Provincial Cinematograph Theatres, Ltd.
E. R. G., *Engineer.*

[The reply of the engineer quoted by our correspondent was, of course, perfectly correct. Supply engineers may make as many "rules" as they think fit, but they can only enforce one of them—that if there is "a leakage from the consumer's wires exceeding one ten-thousandth part of the maximum supply current to the premises," the authorities can refuse to give or to continue a supply of electricity to the premises. There is a general provision in the Act of 1899, that the undertakers are not obliged to give a supply of energy to any premises unless they are reasonably satisfied that the installation is "in good order and condition, and not calculated to affect injuriously the use of energy by the undertakers or by other persons"—any dispute on this question to be settled by arbitration—and no doubt this clause can be made to go a long way towards compelling observance of the undertakers' regulations. But in the absence of special powers, "bluff" is their chief weapon.—EDS. ELEC. REV.]

Proposed Engineering Staff Association.

The leader in your current issue states that "hitherto the attempt to form an Association has failed." But one should not take such words as an indication of our success in this instance. To do so would be to stray quite wide of the facts. There is no reason for any single engineer to suppose that our pioneers are disheartened in any way. But there is every reason, indeed, for every engineer to believe that there is no such thing as failure in the minds of the gentlemen behind the movement, and that the proposed Association will soon be established on proper lines.

One or two correspondents still consider, by the way, that our acting Council should publish their names at once. As it is not, by far, the general opinion, however, the policy, *sub rosâ*, cannot obviously be abandoned just yet. If there were really conclusive evidence that our attitude is unwise, we could not, of course, assure your readers, in all good faith, that quite a large percentage of our letters are from highly-successful members of our profession, and that support is being given and promised by every kind of engineer, from manager to student.

Again, so long as we receive fair play, we do not mind, in the least, if our efforts are occasionally coupled with the name of "Trade Unionism." We merely suggest that such unions are entitled to fair play also. Deeply-rooted as may be the objections to the conduct of some of them, and however inconveniently their proceedings may interfere with our work now and then, impartial critics are bound to confess that they have justified their existence many times.

Our legal and medical friends, for instance, cannot possibly deny that their very status is part and parcel of the fundamental law of "unionism," or that each year, through their Associations, they are working to strengthen this law. In fact, such professional devotees would doubtless be the last to deny that it is now the turn of the engineer, who rightly sees that something similarly protective must be cemented into the structure of our own profession as well.

So, in a word, we want 20,000 members, at least, by the end of this year. And we want more workers instantly, and the names of interested engineers sent in. Other requirements should then follow in due course.

The Association simply has to live now. It is the one absolute necessity.

For the **Acting Council of the Association.**
L. H. FLETCHER, *Hon. Secretary.*

31, Queen Victoria Street,
London, E.C., *July 14th*, 1913.

[The "gentlemen behind the movement" are quite within their rights in withholding their names from publication. Whether, however, they are consulting their best interests in refraining from taking the Press into their confidence, is less certain. As we know nothing about the promoters and objects of the proposed Association, beyond the statements contained in the letters from Mr. Fletcher which we have published, we are not in a position to comment on the merits or demerits of the scheme.—EDS. ELEC. REV.]

A One-Day Sale.—By a one-day special-offer sale at St. Louis, the Union Electric Light and Power Co. added 1,875 electric irons to its local circuits, securing this 1,031 KW. of connected load at a total outlay of only 84·6 cents per KW., including all expenses for advertising, post cards, delivery of irons, &c. The annual energy consumption of these 1,875 irons is estimated at 215,625 KW.-hours; hence this one-day campaign will bring the central-station company an increased revenue of $15,093.75 per year.

The irons were offered to customers at a special price of $2.95 for only one day, May 13th. Each iron purchaser also received a small shirt-waist ironing board. These boards cost approximately 30 cents each, manufactured in quantities. The expense of delivering irons and boards to customers was 12 cents each.—*Electrical World.*

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

The Siemens Combined KW.-hour and Demand Meter.

This meter has been designed to enable central station engineers to charge consumers, particularly power consumers, on a load-factor basis—the load recorded being an average load taken over 15, 30 or 60 minutes. Thus, in addition to the ordinary unit dials, there is a load pointer moving over a divided scale of 300°.

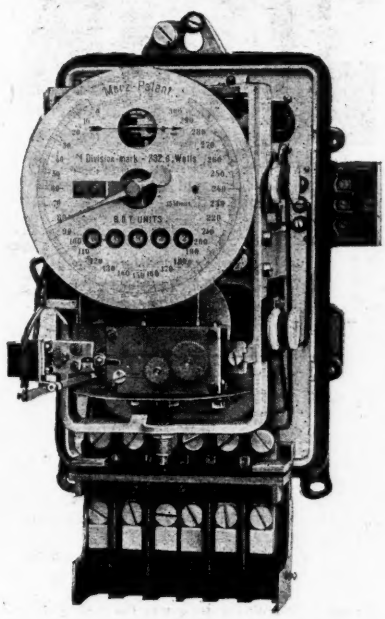


FIG. 1.—KW.-HOUR AND DEMAND METER.

The diagrams, figs. 3, 4 and 5, refer to a three-phase three-wire meter; fig. 5 is a diagrammatic sketch view showing only the essential parts and their relations in order to make the construction and operation clear.

In this diagram the induction meter system of a single or poly-phase meter will be recognised in the spindle and disk, magnet, and counter system, A, M_G, S_1, S_2, W. A pinion on S_2 drives through V, wheel B, which normally gears with wheel M forming the connecting link between the meter and demand indicator pointer Z.

Turning to the lower part of the diagram, the induction motor element E, armature disk B_1, wheel-train and tripping cam C, controlled by a hair-sping and escapement H_S, form a timing gear, which, through a trip rod, momentarily lifts A_B at predetermined intervals of time, thus disengaging B from M for the instant. M carries a pin S_T which, in moving, pushes the demand pointer Z round until the tripping action takes place, when spring F retains the pointer—which is otherwise free on its fulcrum—in its then position, while at the same time the spring R returns wheel M and pin S_T to its zero position ready for the cycle of operations during the next time interval. Obviously, if the average load of the next time interval is greater, the demand pointer Z will be carried a little further over the scale, and, in fact, it will remain at the highest average load indication, until reset.

It will be noted that the position of pointer Z is directly dependent on the revolutions made by the meter armature in the chosen time period. The uses of this instrument are particularly valuable:—

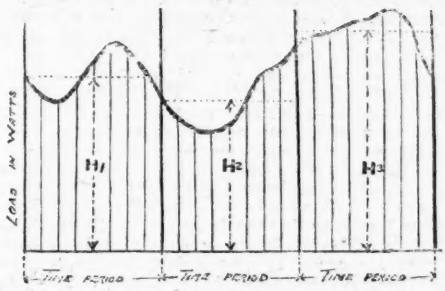


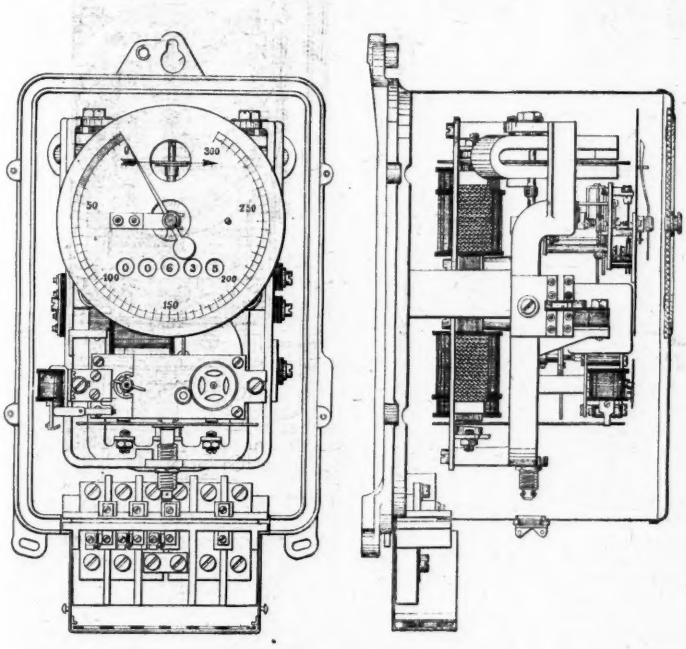
FIG. 2.—SHOWING A LOAD CURVE, H_1, H_2, H_3, BEING AVERAGE LOADS, OF WHICH THE HIGHEST WOULD BE INDICATED.

1. In Great Britain the charge is based on so much per kilowatt demanded, as registered on the demand indicator, this charge being arranged to cover capital cost of the station. A charge of so much per unit is then made to cover running charges and profit. The usual time period is a quarter of an hour. There are several cases, however, of 10, 20 and 5 min. periods. On the North-East Coast a 60 min. demand period is used. This, however, in the opinion of most engineers, is rather too long, except in the case of very steady loads. The general rule is that the less steady the load, the shorter the period should be. The 15 or 20 min. period, however, is the favourite, and seems to cover the general run of requirements.

2. On the Continent the same system, as outlined above, is used, but a more favourite form is to divide the KW.-hours as recorded on the unit dials by the kilowatts as recorded on the demand scale, since the kilowatts cancel out, the hours of use over some definite time period as then given. For example:—

$$\frac{\text{KW.-hours}}{\text{kilowatts}} = \text{hours of use.}$$

A standard rate per kilowatt is charged, with a discount which increases in progressive steps as the hours increase, or in other words, the discount increases as the load factor increases.



FIGS. 3 AND 4.—FRONT AND SIDE VIEWS OF METER.

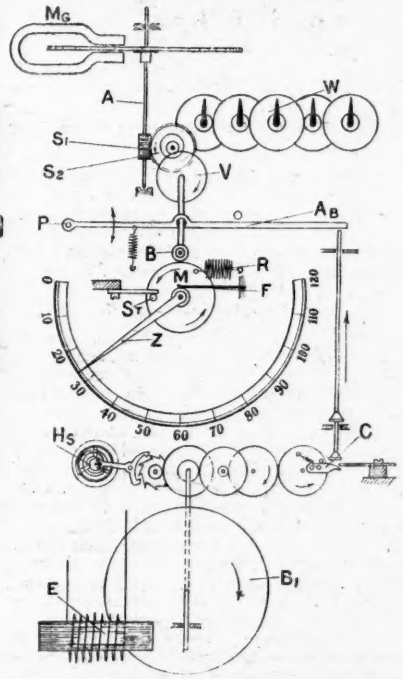


FIG. 5.—SHOWING METER MECHANISM DIAGRAMMATICALLY.

3. In U.S.A. and Canada they do not usually use the KW.-hour dials at all—*i.e.*, the unit dials—but simply charge so much per annum per kilowatt. As a rule in Canada, about $30 per year per kilowatt is charged, and a shorter time basis is taken, usually 5 or 10 min. The units are read off, however, and this information is kept for adjusting the charge per kilowatt, as in that way each individual consumer's load factor is on record. In

water-power stations, where long transmission lines are employed, an additional price per kilowatt is also charged, according to distance from the hydro-electric station.

The feature of the instrument, which is supplied by MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., of Upper Thames Street, E.C., is that it enables energy to be sold on a true load factor basis, and it is essentially an instrument for selling energy to power-consumers, or those who are large enough to be classed as such.

An Electric Motor Dust Cart.

In a recent issue we referred to the fact that an electric motor dust cart had been put into service by one of the municipalities near Berlin, Germany. The example thus set has been followed by the Third Avenue Railroad Co., of New York. In railway and tramway work there is always a large amount of carting work to be done. Dirt that accumulates along the track must be conveyed to the docks, ashes must be removed, and coal handled. The railway company above mentioned has hitherto employed eight two-horse and a number of single-horse vehicles for this purpose. Some time ago, however, the engineers of the company decided to make a trial of electric traction. Taking one of the old "dump" or dust carts, the shafts were removed and an iron frame added to support the battery, and a single motor wheel, made by the Couple Gear Co., of New York, was mounted just forward of the driver's seat. The result was the three-wheeled cart shown in the accompanying illustration. The vehicle, which is propelled by a 4-H.P. electric motor, built up with the hub of the single front wheel, has a capacity of 2 cb. yd., equal to a load of about 2 tons. The battery is of such a size as to enable the vehicle to be kept at work all day, and the motor is stated to be powerful enough to negotiate hills easily, even with a full load, The machine requires much less room for handling than the old horse-drawn carts, since the front driving wheel, which is also the

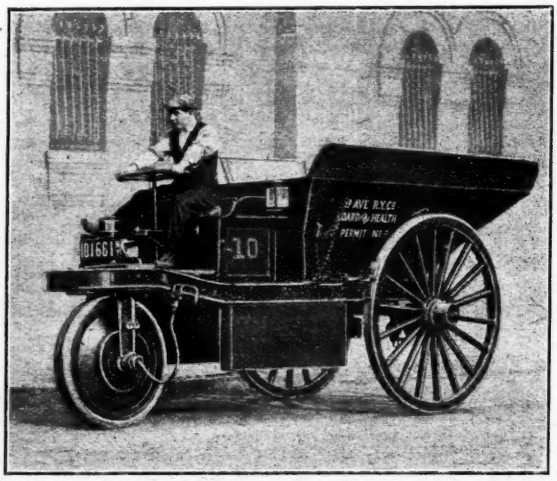


FIG. 6.—AN ELECTRICAL DUST CART.

steering wheel, may be turned at right-angles and the machine pivoted in its own length. In the short time that it has been in service, it has been put to some very severe tests, and so satisfactory has it proved that it is probable the remaining horse-drawn carts will shortly be converted to electric traction. For our illustration we are indebted to the "Edison Monthly."

Bennis Grates at Neasden.

At the Metropolitan Railway Co.'s Neasden power station the boiler house has recently been extended, and now accommodates 20 water-tube boilers. The grates of these boilers are now being renewed with the Bennis patent chain-grate stoker link, several of the furnaces having already been fitted. The full order is for 40 grates to be fitted with Bennis-Miller-Bennett links, including change speed continuous driving gear. This link, which is made by MESSRS. ED. BENNIS & CO., of 28, Victoria Street, S.W., is specially adapted for slack coals, and can be applied to any existing chain-grate frames; the links are so constructed that they are halved together, and rounded at their ends. The upper surface of the grate therefore remains continuous across the junction of each pair of links, and there is no opening through which ashes or clinker can fall, or an excessive quantity of air gain admission, even at the ends, where the chain passes over the revolving mechanism. The air space is graduated by means of a serrated link, and a larger amount is provided per square foot of grate than is possible with a straight link. The result of this is that each part of the fire get its due proportion of air.

In an ordinary chain grate the portion at the rear is covered by the dumping bars, which also act as an air seal and safety device, and prevent clinker falling into the chinks between the ends of the links as they turn over. At the front end of the stoker much useful space is lost for a similar reason, fresh fuel having to be fed on to the grate at a point where the bars have closed. The length of the grate has therefore to be made longer than would otherwise be requisite. By the simple device of halving the width of the link at the point of juncture with the succeeding link in series, an uninterrupted sequence is obtained with the Bennis link, which prevents the admission of excess air, while it ensures a sufficient supply for perfect combustion, and increases the grate area as much as 30 per cent. Dumping bars, which constantly burn out, are not required. Ashes and clinker are tipped by dumping plates, placed below the level of the upper run of grate,

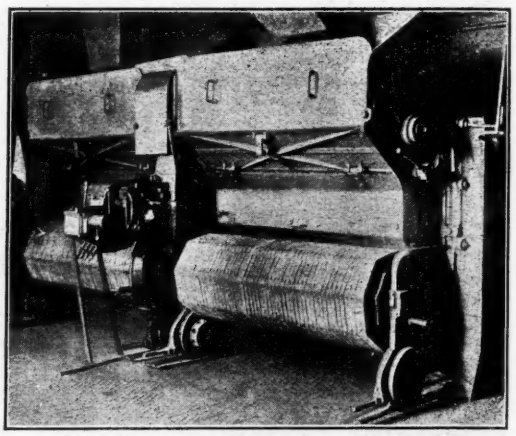


FIG. 7.—BENNIS CHAIN-GRATE LINKS, AS FITTED AT THE NEASDEN POWER STATION.

on to a dumping valve, whence they can be removed as required without stopping the stoker or interfering with its mechanism. The dumping plates and valves are so arranged as to prevent the ingress of excess air at the back of the grate. By means of Bennis air seals, fitted at the side of the grate, between the frame and sill plates and between the frame and side links and at the back of the grate, the entry of excess air at these points is altogether prevented.

"Geeko" Intercommunication Telephones.

The new "Geeko" double-line intercommunication telephone, which will shortly be placed on the market by the GENERAL ELECTRIC CO, LTD., London, requires only one operation for selecting and ringing; in other words, "push one button once only."

Besides being simple in operation, these telephones have been improved in construction, so that they are free from all "cross-talk" experienced with single-line telephones. The "Geeko" double-line auto-reset wall and table intercommunication telephones

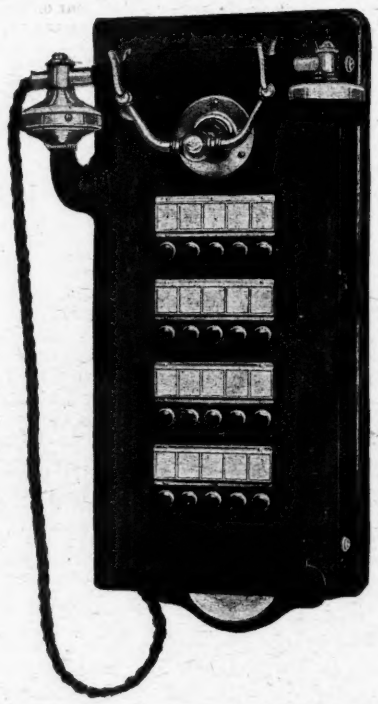


FIG. 8.—GEEKO INTERCOMMUNICATION WALL TELEPHONE.

comprise a hand combination fitted with Hunningscone-Deckert transmitter, equipped with an induction coil, circular bell, automatic cradle switch, and specially designed combined line selecting and ringing auto-reset push-buttons. All terminals are enclosed, and the external metal parts are nickel plated. The woodwork is of well-seasoned polished walnut. The table set is provided with a cord and wall rosette. The wall type is shown in the accompanying figure.

A New Oil-Testing Machine.

The British Oil and Turpentine Corporation, Ltd., of Hayes, Middlesex, has recently introduced in connection with its business in lubricating oils, a machine, constructed to Hislop's patent, for testing the suitability of oils both for bearing and cylinder lubrication. The machine, which we illustrate in figs. 9 and 10—the former view showing the arrangement for testing oils for bearing lubrication, and the latter, the apparatus for testing cylinder lubricants—is carried on a cast-iron frame and worked by a steam or petrol engine. For the former purpose, the machine consists essentially of a revolving spindle and tachometer, the spindle being of steel, gun metal, &c., and arranged to run in two detachable half bearings or dies of such metal as will approximate to the conditions of use of the lubricant under test.

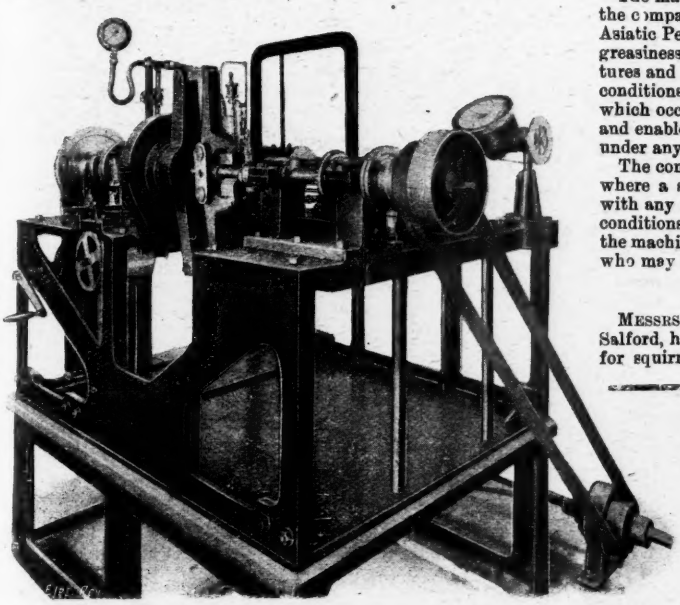


Fig. 9.—Oil-Testing Machine, showing Arrangement for Testing Bearing Lubricants.

The dies are held on to the spindle by means of the pressure, applied through bell-crank levers, of a heavy spring carried in a hollow casing, projecting arms from which bear on the ends of the levers. The spring pressure is put on by means of a screw and gearing, its amount being registered by a dial. Any friction between the spindle and dies tends to rotate the latter, together with the bell cranks and casing, this movement being controlled by a spring and referred by a suitable pencil attachment to a paper chart carried by a slowly revolving drum.

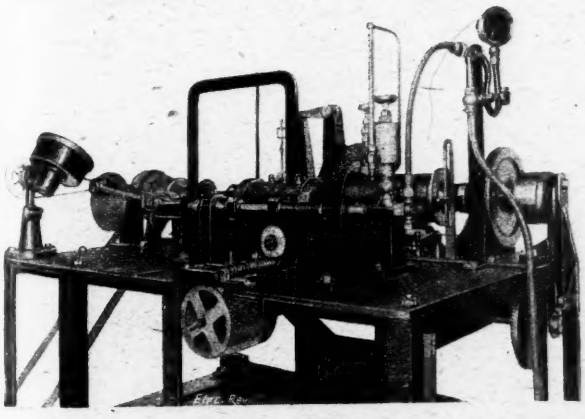


Fig. 10.—Arrangement for Testing Cylinder Lubricants.

In the case of a suitable lubricant, for instance, under the given conditions, the friction load would remain nearly constant, despite increasing temperature and a fairly straight line would be traced round the circumference of the revolving paper drum; on the other hand, a very unsuitable lubricant would result in curve tending towards the axial direction.

For obtaining tests on thrust lubrication, the spindle and bearing dies are replaced by polished face plates, one taking the thrust, directly, of the spring, and the records are obtained as before. Ball thrust bearings are fitted and thermometer pockets are provided in the stationary friction members for obtaining temperature records. The other portion of the machine for dealing with cylinder lubrication consists primarily of a small cylinder carried and arranged to slide on horizontal guide rods, one on each side, and fitted with an adjustable expanding piston worked by means of a crank and connecting rod. Steam or burnt gas at required temperature is introduced through a pipe at the back cylinder cover, the pipe being provided with a sight feed lubricator for introducing the oil under test, pressure gauge, &c.

Assuming conditions such as would result in considerable friction, the cylinder, if free, would reciprocate with the piston. The cylinder movement is, however, controlled—a spring controlled ratchet device preventing forward movements, while backward movements take place against compression springs and (being a measure of the friction, and therefore suitability of the lubricant) are transferred by a suitable pencil attachment to a slowly revolving graphic recording drum similar to that used on the other portion of the machine.

The machine is the invention of Mr. R. C. Hislop, a director of the company, and lately chief engineer in the Far East of the Asiatic Petroleum Co. By its use it is possible to show the initial greasiness of an oil, its viscosity and life under varying temperatures and loads, and the quantity of oil required under the specified conditions. The cylinder shows the great increase of friction which occurs when a cylinder oil is used that readily carbonises, and enables the users to obtain the most suitable lubricants for use under any conditions in petrol, gas, oil or steam engines.

The company has already proved its value in one or two instances where a special oil was called for, which could only be supplied with any degree of certainty after testing various samples under conditions approximating to actual use, which were obtained on the machine, and it is prepared to undertake such testing for others who may be interested in obtaining more efficient lubrication.

A New Star-Delta Starter.

Messrs. Switchgear & Cowans, Ltd., of Springfield Lane Salford, have recently developed a self-operating star-delta starter for squirrel-cage induction motors, designed to meet the Home Office requirements as regards both factories and fiery mines; it possesses, in addition to the usual overload and no-volt trips, features which make it capable of protecting motors and plant against mishaps through handling by unskilled persons and from damage by any but the most violent forms of mischief. To start a motor it is merely necessary to switch on by means of the handle, all further operations being left to the control of the starter.

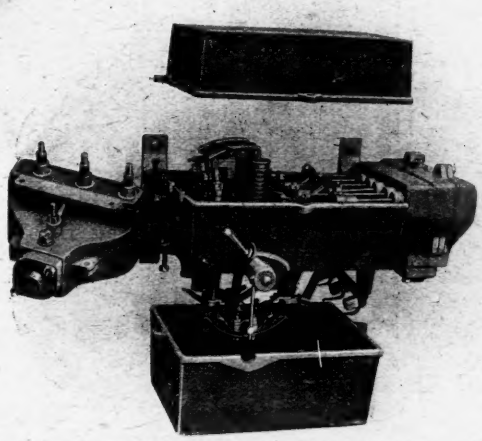


Fig. 11.—Self-Operating Star-Delta Starter, showing Mechanism.

The action of switching on closes the circuit and sets the change-over switch on "star" connection (the laminated copper brushes and the knife type change-over switch with their substantial

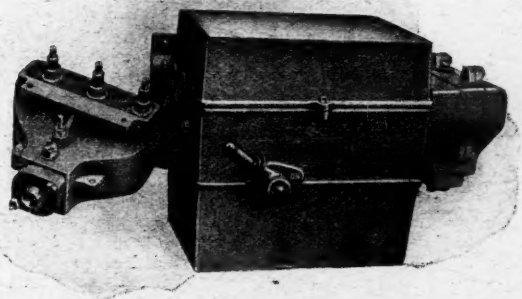


Fig. 12.—Complete Starter, with Cable Boxes.

auxiliary contacts are clearly seen in fig. 11). When the motor has attained a predetermined speed, the switch automatically changes over from "star" to "delta," sufficient adjustment being provided

to allow change-over to be at normal working current or below it, or, as is sometimes necessary, above it. Switching off is either by hand, or, in the event of overload or loss of voltage, automatic.

It is impossible to close the switch on a short circuit; moreover, if for any reason such as an excessive starting load or a seized bearing, the motor fails to attain within an adjustable limited time the speed at which the change from "star" to "delta" is arranged to take place, the circuit is broken. This feature is obtained by an ingenious application to the overload trip of the well-known Statter time lag, together with a simple magnetic arrangement by which the pull for a given current value, tending to operate the overload release in the "star" position, is less than half the pull for the same current value tending to operate the overload release in the "delta" position, thus providing perfect protection against overload both in starting and in running. All contacts are oil immersed. The makers supply the starter with or without cable boxes, or with inlets and outlets either screwed for conduit or merely bushed.

The "Horophone" Wireless Receiving Set.

The accompanying illustration, fig. 13, shows an entirely new departure in wireless receiving sets, which the SYNCHRONOME CO., LTD., 32, Clerkenwell Road, E.C., have placed on the market. The apparatus is appropriately called the "Horophone," and has been introduced to enable watch and clock makers to take the time signals under the new international arrangements which came into force on July 1st. In the centre is a large inductance with two sliders, which will enable stations of long wave length to be picked up on small aerials. A variable condenser is provided, also a blocking condenser, and a buzzer is fixed inside the case, with a press-button to operate it on the outside for testing purposes. In addition to the necessary terminals, a plug is provided for the purpose of earthing the aerial during thunderstorms.

The crystal detector shown on the right is of new design, the top and bottom castings giving it a rigidity which prevents it easily getting out of the adjustment. Another important feature is the use of ball-and-socket joints, which enable any part of the crystal to be selected. The crystal itself is similar to silicon, but is more sensitive and reliable, and does not require a local battery; in

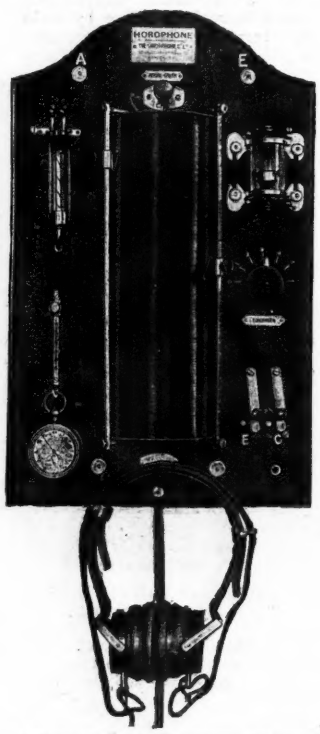


FIG. 13.—"HOROPHONE" WIRELESS RECEIVING SET.

fact, it has been found that applied E.M.F. renders it less sensitive. The crystal, &c., is enclosed in a glass cylinder, thus affording protection against dust, &c., and the whole detector can be taken to pieces in a few seconds by simply loosening the four clamping screws.

The apparatus is made in two different types, Type A comprising all the instruments mentioned above, while Type B, which has been selected for illustration, has in addition an electrolytic detector, potentiometer and dry cells, and a change-over switch for selecting either detector; double headgear telephones of 2,000 ohms resistance are always provided. When not in use, they are replaced on a hook, which in Type B takes the form of a switch; thus when the telephones are replaced, the local battery current through the detector is automatically switched off. If desired, a high-class chronograph watch is supplied with this set at an extra charge.

The whole apparatus is neatly mounted and joined up on a polished hardwood board, and, being listed at a moderate price, should appeal to those who are taking up the study of wireless telegraphy, as well as to professional men.

The Blackman Intermittent Fan.

We have received from the BLACKMAN EXPORT CO, LTD., of Blackman House, 374, Euston Road, N.W., particulars of their new intermittent fan, which they have just placed on the market. This fan, which embodies all the latest improvements in fan construction, is unique and differs greatly from other fans of this class, because, in place of the usual continuous draught, it creates breezes of continually varying intensity, which come and go at intervals

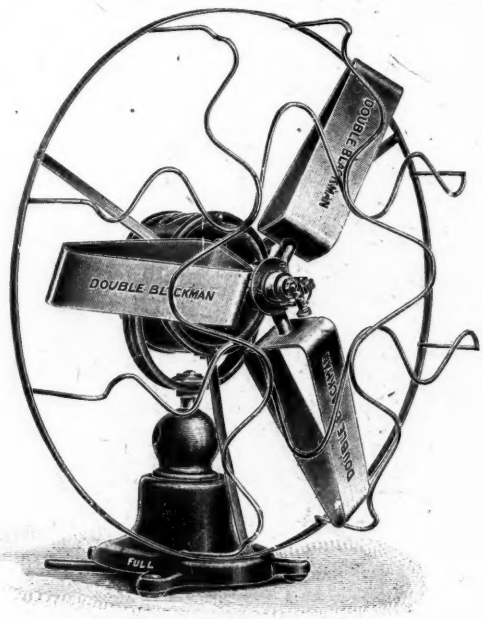


FIG. 14.—BLACKMAN INTERMITTENT FAN.

which can be changed at will; they can also be made to blow in one direction intermittently or in both directions alternately. In the latter case, the effect is similar to that of the punkah. The reversing of the air current and the changing of its intensity are accomplished by means of a gradual alteration in the angle of the fan blades, which are automatically and noiselessly controlled by a simple mechanism requiring no attention.

Although these fans are not intended to be used as ventilators, they may advantageously be placed near open windows or other air inlets to modify the inflowing current of air, so that a dangerous draught may be transformed into a beneficial breeze.

A Handy Wire Drum.

MR. H. W. BROTHERTON, of Brocklesby, has devised an apparatus which should be found useful by contractors. As illustrated herewith, it consists of a series of detachable drums on a stand; the sides of each drum are separate from the drum, and the latter consists of a sleeve, which can be chosen of the right diameter to fit

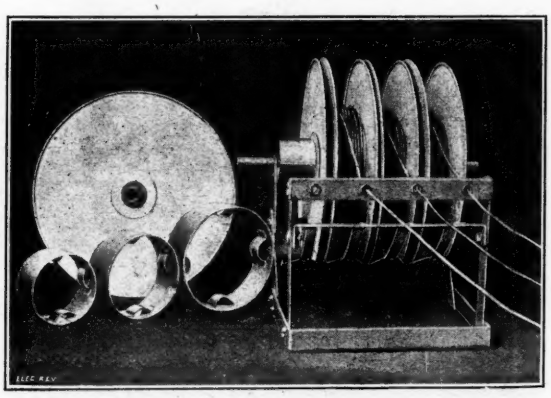


FIG. 15.—SAFETY MULTI WYRDRUM.

any maker's coils. The coil of insulated or other wire is placed on the drum and the latter is put together and mounted on a spindle, each of the four drums shown being independent of the rest. Any length of any of the wires can thus be drawn off as required, passing through a bushed guide. Kinks are done away with, and the wire is unwound without twisting. Damage to the insulation is avoided, and the wires, when drawn into conduit in the straight condition, can be withdrawn easily in case of need. The device is made

entirely of metal. Besides the advantages above-mentioned, the damage so often inflicted on wires left lying on the floor, due to damp or workmen's boots, is obviated, and there is a marked economy of time and labour in wiring.

MR. ALEX. SHAW, of 18, Story Street, Hull, has been appointed selling agent.

Drum Controllers and Starters for Slip-Ring Motors.

The accompanying illustration shows one of the E.A.C. rotor-controllers, which are all of the oil-immersed type, and are intended for use wherever the duty is severe, as, for instance, in mine haulages or some textile operations. They are fitted with the E.A.C. finger,

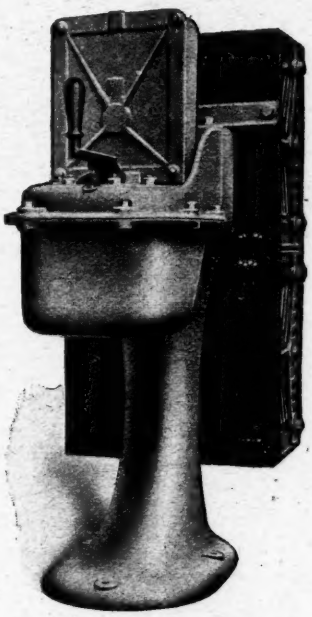


FIG. 16.—E.A.C. DRUM CONTROLLER.

shown in fig. 17, and are insulated throughout with moulded mica. The resistances in the case of starters are usually immersed in the same oil tank as the controller proper; in the case of controllers, separate ventilated grid resistances are supplied. The contact fingers being identical with those used in E.A.C. oil switches and

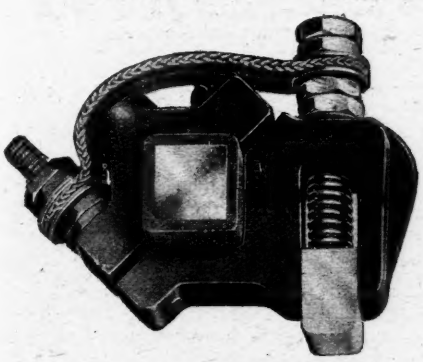


FIG. 17.—E.A.C. CONTROLLER FINGER.

squirrel-cage starters, a single stock of spare parts is sufficient for a complete installation comprising oil switches and starters of all types. Fig. 16 shows a controller, mounted together with its resistance, on a cast-iron pedestal. This switchgear is made by the ELECTRICAL APPARATUS CO., LTD., of Vauxhall Works, South Lambeth Road, S.W.

The Motograph Sign.

One of the novel outside electrical features which aroused wide-spread interest among hundreds of N.E.L.A. Convention delegates at Chicago was the "motograph." This is a panoramic "talking sign" operated by perforated paper rolls. Each letter appears at the extreme right, travels the entire length of the sign, and disappears at the extreme left. There is a continuous flow of letters, three or four words being visible constantly. The installation was made by the MOTOGRAPH CO. OF AMERICA, Detroit, Mich.

The motograph displays the advertising bulletins under a moving washing machine and figure of a woman operator.

The installation consists of a bulletin panel containing 1,360 10-watt, 115-volt tungsten lamps, arranged in 10 horizontal rows of 136 lamps each. The lamps are 4·5 in. apart. The total length of the bulletin panel is 51 ft. The height of the letters produced is 4 ft. The entire electrical display is 65 ft. long and 70 ft. high.

The perforating machine will produce old English, script or block letters, and even complicated characters, such as Chinese symbols, if desired.

The operating device is an automatic motor-driven controller of special design, which operates the perforated tape and effects a quick succession of "makes" and "breaks." The paper tape is said to run through the controller at the rate of 33 ft. per minute. The roll used in this particular installation contains 100 words, operates continuously for 3 min., and then repeats.—*Electrical World.*

New Thrust Bearing.

A new type of thrust bearing, invented by Mr. Albert Kingsbury, of Pittsburg, is described in the *Electrical World*. The defect of ordinary thrust and footstep bearings is that the wedge-shaped film of oil which ensures the lubrication of cylindrical shafts cannot be formed between two continuous flat surfaces. Mr. Kingsbury gets over the difficulty by dividing the stationary part of the bearing into six independent sectors, each of which is free to rock a little on its supports, so as to adjust itself to the best conditions. The bearing runs in a bath of oil, which penetrates between the surfaces and forms the oil wedge which is essential to effective lubrication. The bearing is made by the WESTINGHOUSE CO., of Pittsburg.

LEGAL.

BRITISH INSULATED AND HELSBY CABLES, LTD., *v.* LONDON ELECTRIC WIRE CO. AND SMITHS, LTD.

As reported last week, this matter was concluded in favour of the defendants.

We have received the following copy of the judgment given by Vice-Chancellor Dudley Stewart-Smith, Esq., K.C., at the Chancery Court at Liverpool on July 7th.

The VICE-CHANCELLOR: This is an action for infringement of two registered designs for trolley wire, to which the defences are want of novelty and non-infringement. One of such designs, numbered 521,209, was registered on March 7th, 1908, and has been called in the case Design A. The other, numbered 522,640, was registered on April 9th, 1908, and has been known as Design B. The registered design in each case shows the wire in perspective, with a full cross section. Both wires are grooved. In A, the part above the grooves is nearly semi-circular. The part below forms the segment of a larger circle. The grooves are semi-circular, and their shoulders parallel. Design B differs slightly in that the shoulders of the grooves are not parallel, but open outwards, and the bottoms of the grooves are flat and not semi-circular. Both wires are about ½ in. broad between the lower shoulders at their broadest part, and are rather less from the top of the semi-circle to the lowest part of the segment. In support of the defence of want of novelty, particulars have been delivered of a large number of previously-published designs. That made by the Trefileries et Cie. of Havre (No. 1 in the particulars), the other made by Thomas Bolton & Sons, Ltd. (and numbered 2 in the particulars), which were selected by the defendants and principally relied on, are distinguishable from Design B only in this, that the lower part of the wire is slightly smaller in relation to the upper part, and the lower part is slightly more circular, and the grooves have a circular bottom instead of a flat one. Judging by the eye alone, I think the differences are so slight and unimportant as to bring the case within the principle laid down in Le May and Walsh, 28 Chancery Division, 24, and that the plaintiffs' designs are not novel The main contention of the plaintiffs, however, is that the plaintiffs' design is functionally more perfect, and though it is conceded that utility as such is immaterial, the Court is bound to consider the reason for making the design of the shape and configuration which is to enable it to judge whether differences which appear minute are not in reality substantial. The claim in the present case is for novelty of shape. Lord Herschell, in the Heda Foundry Co. *v.* Walker, 6 Patent Office Reports, 554, says:—"I do not think the object which the designer has in view in adopting the particular shape, or the useful purpose which the shape is intended to serve, or does serve, ought to be regarded in considering what the design protected. The scheme of this part of the Act is entirely different from that relating to patents for inventors, and, adopting the words of Lord Shand, in Walker *v.* The Falkirk Iron Foundry, the Act in this branch gives only protection to the shape or configuration in such a case as the present. The result of such protection may be, however, to secure . . . if this should be the result, directly and indirectly, of the shape or configuration . . . but this is a mere incident. If such advantages are obtained, it is only because . . . and which is, therefore, not an improvement, will achieve the same end." The plaintiffs' design is for a useful article, and it is said that wire made in accordance with it has a greater functional value than any other, and the case of Tyler *v.* Sharpe, 11 Patent Office Reports, 357, was relied on. The design in that case was for a water-closet basin, the feature being that it enabled the siphons to be made separately, and to be joined at any angle suitable to the outlet pipe. In giving judgment, Mr. Justice Romer says:—"In my opinion, on the evidence it is established that the plaintiffs' design has distinct advantages over the prior designs for similar articles which have been put in evidence for the defendant . . . advantages—that is to say, in this respect, advantages of importance to the manufacturer on the question of utility, such advantages as cheapness of manufacture, strength of the article, and so forth." As I understand the design, the learned

Judge was satisfied that, independent of these special considerations, the plaintiffs' design was novel in shape and in no way purports to depart from the principle of the Heda Foundry case. On this contention the history of the design becomes important. The wire is of copper, and is used for overhead tramway systems to convey electricity to the car. This is effected by suspending the wire in clips or ears, and the communication is made by a grooved wheel on the summit of an arm extended from the car, the groove pressing against the wire. The plaintiffs put their case thus:—In 1903 they turned out a large quantity of ordinary circular copper tramway wire supported by ears soldered to the wire. The effect was that the grooved wheel jumped and hammered as it passed under the ear. There was an uneven transmission of current, shaking and additional wear and tear were caused, and the wire was frequently broken. Endeavours were made to produce a non-fouling wire—one on which the ear did not protrude beyond the wire. The first attempt was to cut a V-shaped groove in the middle. Then the wire was cold drawn into a figure 8. This form was common in 1904. The dumb-bell shape was then adopted, which did not prove satisfactory. The object to be attained was perfectly smooth working, a complete support to the wire by the clip, which made it necessary that the neck should not be too narrow, that the end of the clip should not protrude beyond the lower segment of the wire, so that there should be no contact with the ear in case of tilting, and that there should be the largest possible contact surface between the wire and the grooved wheel. It is claimed for wire made on the plaintiffs' designs that it fulfils these conditions, and that no previous wire had done so, that the ear can support the wire, when protruding over it the neck formed by the grooves is sufficiently strong for support, and that the lower segment of the wire, being relatively larger than those previously in use, affords a wider contact surface. It appears from a work published by Mr. Phillip Dawson, an engineer of distinction, in 1903, that down to that date the figure 8 wire had not proved satisfactory, and that the circular wire with grooves had given a better result. This passage was put to Mr. Swinburne, a witness for the defendants, and he said, whilst disclaiming any special knowledge, that he did not know of anything which happened between the years 1903 and 1908, which would make this description inaccurate in 1908 if it were accurate in 1903. Then Mr. Higginson, who is an engineer with a special experience in tramway work, and whose company manufacture tramway wire, says that the non-fouling problem had been solved before 1908 by grooved wire and other designs in which there were slight variations in the depth of the groove and the size of the head, and I think that this evidence is in accordance with the facts. No evidence was called showing that an alleged increase of contact would make any appreciable difference in the volume or strength of an electric current conveyed to a trolley wheel. To cold draw a wire into Design A is a more difficult and expensive operation than to draw it to Design B. As in the first case, the groove is narrower by reason of the upper and lower sides being parallel, and in the latter the sides of the groove open outwards. The plaintiffs appear to have supplied wire on Design A only to the Yorkshire Woollen District Tramways once in 1908, and a repeat order in 1911. It has not otherwise been used. There is no evidence that a groove flat at the bottom has any greater utility than a groove which is circular at the bottom. In a design so minute the difference must necessarily be small, but applying the eye, with the special instructions given by the expert witnesses, I am unable to conclude that there is any special advantage which wire, manufactured on the plaintiffs' design, gives which is not given by Nos. 1 and 2 in the particulars of objection, and probably many others. I think it is probable that Design B does give all the advantages of 1 and 2, but there is no evidence that it does in fact give greater advantages. So that, applying all the tests of advantage referred to by Mr. Justice Romer, the plaintiffs' wire, tried by those tests, does not seem functionally better than many of its predecessors. I am, therefore, driven back to the eye alone, and, judging by that, I am unable to see such a distinction between the plaintiffs' design and Nos. 1 and 2 as will enable me to say that the plaintiffs' designs are novel. As, however, another Court may take a different view, I will deal with the other points raised in the case. It is contended that, even if Design A could be otherwise supported as a novel design, it was, in fact, published by plaintiffs prior to registration. Between September, 1907, and February, 1908, the plaintiffs were endeavouring to obtain an order for trolley wire from the Yorkshire Woollen District Electric Tramways by correspondence with Mr. Goldston, their engineer. The order was obtained, and on February 25th, 1908, the plaintiffs sent a sample of the wire they intended to supply. It was in the form of Design A. Mr. Goldston wrote criticising the design, and making suggestions as to shape which were not given effect to by the plaintiffs. The wire was delivered in accordance with the sample. On February 29th the plaintiffs wrote confirming the price, and said that the design was duly registered. This was not quite accurate. A letter of inquiry had been sent to a patent agent asking advice, but the drawings were not sent to him for some days afterwards, and the design was not actually registered until March 7th. There is nothing in the correspondence to show that the communication of that design to Mr. Goldston was confidential. He could, without breach of faith, have shown it to his employers or anyone else. He did, in fact, show it to Mr. Paris, the managing director of the tramway company, but there is some uncertainty as to the exact date. I think these facts amount to publication by the plaintiffs before March 7th. A communication was made for a particular purpose, and effected that purpose. If this order had been obtained, I doubt if this particular design would have been registered. No intention to register it was communicated to Mr. Goldston until after the negotiations for purchase were at an end. The registration was held bad on Winfield *v.* Snow, 8 R, P., 15, a case very like the present. On this special ground also I think the registration of Design A invalid. On the question of infringement of B, if valid, the plaintiffs are in this difficulty. If the differences between that design and numbers 1 to 2 are sufficient to give novelty to B, the differences between B and the alleged infringements gave novelty to them. The diagrams and specimens of wire have been put in, and the only difference, not within working limits, between 1 and 2, Design B, and the infringements, is the flat bottom of the grooves in B, which is not shown to have any functional value. Even in supplying the same order—sometimes for several miles of wire—it is impossible to ensure absolute uniformity in shape throughout as the wire is cold drawn through dies, which wear with use, and this fact may account for some of these slight differences on which stress has been laid. If Design B is valid I hold that there has been no infringement. There will be judgment for the defendants.

POULSEN TELEGRAPHONE PATENT.

(*Concluded from page* 51.)

MR. COLEFAX said that the attempt to put the invention to a commercial use had been the serious difficulty of the companies concerned. It was patented practically throughout the whole world and nearly all the patents were in force at the present time. The time allowed for the British patent was the shortest period for any of them. Proceeding, counsel dealt exhaustively with the history of the companies which had been formed from time to time to work the patent. The invention, he said, was brought out in 1899 and the complete specification was not accepted until March, 1900. Mr. Poulsen had devoted much time and had spent a great deal of money on his invention, and with two more gentlemen, named Fogg and Ludd, he formed the Danish company, which he would call the parent company, in April of 1900, with a capital of 2,000,000 kroner. That capital was entirely in shares, Mr. Poulsen retaining one quarter. Shortly after the promotion of the company efforts were made to deal with the invention in the U.S.A., in Great Britain, Canada and Mexico. Counsel proceeded to show what had happened to these and to some other companies, some paying no dividend and some being defunct. The Telegraphone Co., of Columbia, was formed with a capital of $10,000,000, of which 4½ million dollars worth of stock was issued to the parent Danish Co. In 1905 the Telegraphone Corporation was formed, and that was the petitioning company. Demonstrations of the invention were given to his Lordship, one of the witnesses addressing him through the telephone.

MR. JAMES SWINBURNE then gave expert evidence. Before this invention, witness said, Edison had invented the phonograph and gramophone, but there were drawbacks to those machines from the point of view of reproducing the human voice because of a nasal twang and distortion which was inseparable with such machines. Then came Poulsen with the invention now before the Court. He had produced a record of the human voice by means of magnetising a piece of steel. It was not at all an obvious idea, in fact, it was so much the reverse that he did not think any electrician would expect the apparatus to work. But it did, and Mr. Poulsen had made a machine which reproduced the human voice without the nasal twang and distortion of the phonograph and gramophone. Furthermore, it was worked by a long strip of wire, which was capable of recording long speeches and conversations.

His LORDSHIP: You can record a conversation of any length, I take it, if you have the wire long enough?

MR. SWINBURNE said there was a limit to the length of the conversation, because there was a limitation in the accuracy of movement. It was a remarkable invention in this respect: nine-tenths of the patented inventions were inventions which came along in the ordinary course of development, but this was not an invention of that character. It was something which struck out in quite a new direction, which no one had thought of before. It was a very difficult idea to work out, but it was put in a far more practical way than Edison had worked out his first phonograph invention.

Examined by SIR J. SIMON, witness said he heard about Mr. Poulsen's machine during the Paris Exhibition of 1900.

Have you ever known these machines to have been bought and sold commercially, or used in any business?—No, I never saw one of these machines until this application for extension of the patent.

Witness admitted that the machine had a drawback from the commercial point of view on account of its expense, but, mechanically, there was no reason why it should not be used commercially. The market was more prepared for such an invention than had been the case, because recently people had been attempting to adapt the gramophone for the purposes of dictation.

MRS. FLORENCE IDA ESLER, assistant secretary and auditor of the American Co., having given evidence,

MR. SCOW, engineer in the employ of the Danish Manufacturing Co., was called. He said he had been engaged in developing the invention. The company were first engaged on a disk machine and manufactured a quantity of them, but afterwards they started making the improved piano-wire machine, which was the latest type. He thought it would prove a commercial success. The Danish Co. were selling this latest pattern machine at 600 kroner, or £33.

In giving judgment, his LORDSHIP said there was no doubt that the invention was a very brilliant one. The idea of storing up sound, not by physical means but by the peculiar effect of an electromagnet on a steel wire or strip, was an idea which no one

except the most skilled inventor would have thought of. But there was this difficulty, that this invention had proved of no practical utility not in the sense of not producing a profit to the persons who worked it, but in the sense that people had not been found to use it. It was admitted on all hands that up to the present moment there had been no demand for the machine, and that was a strong circumstance against the petition to prolong the patent rights. He was bound, in the circumstances, to refuse the petition on the ground that the patentee had not made out his claim that the patent was of sufficient public utility to justify an extension of the patent rights, and also on the ground that the petitioners had failed to show any sufficient reason for the non-attempt to make the machines in England.

MARCONI *v.* HELSBY WIRELESS TELEGRAPH CO., LTD.

IN the Chancery Division on July 9th, Mr. Justice Eve had before him an adjourned summons in the above matter. The action was brought by the Marconi Wireless Co. against the Helsby Wireless Telegraph Co.. Ltd., to restrain an infringement of patent rights taken out by Mr. G. Marconi for which a certificate of validity had already been granted in an action by plaintiffs against the Radio-Wireless Telegraph Co. The summons before his Lordship asked for leave to administer interrogatories in respect of the examination of defendants' apparatus, which defendants had installed at a wireless station at Milton Road, Liverpool. The interrogatories which plaintiffs desired to put to defendants were: did the defendants install and use the plant in question, and, if so, was it of the same construction as that inspected by plaintiffs' representative at a previous date? If the said plant was not the same, had the construction been altered, and, if so, at what time or times, and in what respect? No objection was raised to the interrogatories, with the exception of the concluding question in the last, viz., "and in what respect." It was complained that such an interrogatory was too wide and should be disallowed.

LORD TIVERTON, who appeared for the objectors, submitted that by means of an interrogatory the plaintiffs were seeking to obtain a knowledge of the exact construction of defendants' apparatus. Assuming that his clients had made an infringing apparatus and a writ was issued, then supposing defendants made up their minds not to infringe any longer and to cease making the apparatus complained of, plaintiffs might inspect the different apparatus at the defendants' works and ask whether that was the one they complained of. The reply to that would be that it was not. There was no objection to that, but they had no right to ask a fishing interrogatory, "In what way does it differ?"

MR. GREY, who appeared for plaintiffs, said it would be no advantage to his clients to have got inspection after the writ unless they were told whether the process was the same as that which they complained of and saw at the previous inspection, and if not in what respect it differed. Where inspection was granted after the date of the writ, it was only for defendants to say "we have changed the apparatus," but unless plaintiffs were informed of what had been done the whole object of the examination was gone. He did not ask "What were you doing before the issue of the writ?" That would be fishing. All he asked was, "Did you make a specific alteration after the issue of the writ and, if so, what?" The defendants were not asked to describe their apparatus. He simply wanted to know in what respect the apparatus differed from the apparatus complained of, if it differed at all, and so prevent the whole of his examination being futile.

After considerable legal argument, his LORDSHIP held that the interrogatory orght to be allowed.

MINERS PROSECUTED.

AMONG a number of prosecutions for contravening the Coal Mines Act, tried by the Sheriff at Dunfermline last week, was the case of two miners who were fined 15s., with the alternative of six days' imprisonment, for travelling on an electric haulage road while the haulage was in motion, contrary to the rules.

GRIFFITH *v.* WEBB.

IN the Sheffield County Court on 11th inst., Rose Griffith, a married woman, claimed from Henry J. Webb, trading as the Mechanical and Electrical Engineering Co., of Hereford Street, Sheffield, a sum of £50 for personal injuries sustained through the negligence of one of the defendant's servants in repairing an arc lamp at 62, South Street, Moor, as the result of which the lamp fell on plaintiff's head. From the hearing, as reported in the *Sheffield Daily Telegraph*, it appeared that, on January 6th, and as she was passing Mr. E. L. Dean's shop, a boy was taking down a large electric lamp hanging in front of the shop. The boy, who was a servant of the defendant, was standing on the top of a ladder and was taking down the lamp with a hook. The whole thing gave way, and the lamp fell on plaintiff's head. She was rendered unconscious and was occasioned severe injuries, which had affected her health since. For the defence, it was argued that the accident was not caused by negligence, as the hook unexpectedly broke down, and he contended that the plaintiff's condition before the occurrence was delicate. In any case, the claim for damages was excessive. It was denied that plaintiff was rendered unconscious.

His HONOUR held that there was negligence in the fact that the boy was not supplied with proper apparatus with which to remove the lamp, and he awarded plaintiff £26 3s. 4d. damages.

THE GLOBE ELECTRIC CO., LTD.

IN the Chancery Division on Tuesday, Mr. Justice Neville had before him a summons in the matter of the Globe Electric Co., Ltd., on behalf of a creditor asking that a four-day order should be made to supplement an order of December 13th, 1912. The company are makers of arc and other electric lamps. Under the order of December last, counsel explained, the two liquidators of the company appointed in a voluntary winding-up were ordered to deliver up a consignment forthwith of arc lamps and accessories which had been deposited under an agreement.

His LORDSHIP: Have they not been delivered?

COUNSEL replied that part of them had, and part had not. The liquidators contended that they were not obliged to deliver over those goods which were in the hands of agents. The articles in question were deposited by a Mr. Wiener, the applicant, in the hands of the company under the agreement of 1910.

COUNSEL for the liquidators said that respondents had handed over all the stock in their hands in compliance with the order with the exception of a certain portion of it which was in the hands of agents in all parts of the world. It would be impossible to get those articles back without incurring expense, and the liquidators were not in a position to spend money on recovering them. They had done what they could to comply with the order.

His LORDSHIP thought there had been substantial compliance with the order, and made no order on the summons. If the liquidators had informed themselves more fully how matters stood in the first place, his Lordship remarked, the order of December would not have been drawn up in the terms it had been.

THE NATIONAL TELEPHONE CO.—DISTRIBUTION OF ASSETS.

IN the Chancery Division on Tuesday, July 15th, Mr. Justice Sargant had opened before him a summons taken out by the liquidator of the National Telephone Co. for the direction of the Court as to the distribution of surplus assets between the various classes of contributories.

MR. DANCKWERTS, K.C., who, with Mr. Percy Wheeler, represented the liquidator, said that the summons was an originating summons taken out under the company's Acts by the liquidator to obtain the direction of the Court as to the disposal of certain funds in his hands. He explained that the matter had been before Mr. Justice Swinfen Eady and was argued for two or three days, but then the Railway and Canal Commissioners had not made their award as to the amount the Postmaster-General had to pay for taking over the company's undertaking, and his Lordship adjourned the matter so that he could make a final order disposing of the whole matter. Recent changes had prevented the judge from dealing with it, and the matter, therefore, came *de novo* to his Lordship. The point which the Court had to decide was what was to be done with the surplus in the liquidator's hands? Surplus as applied to a company's assets was used in two senses. First, surplus assets were what was left after the payment of all the outside liabilities of the company, but in another sense, surplus assets were what was left after payment of all debts and liabilities of a company and returning to the shareholders all the money they had subscribed for their shares. It was in the latter sense that the word surplus was used on the question which his Lordship had to consider. The question was who was entitled to a sum of £200,000, which roughly represented the surplus of assets of the Telephone Co. in the sense he had told his Lordship the word was used in this case. The parties interested were set forth in the affidavits of the liquidator, and they were, first the holders of 15,000 first preference shares of £10 each, carrying interest at 6 per cent. They were represented by Mr. Butcher, K.C., and Mr. Cartmell. Secondly, there were the holders of 15,000 second preference shares, which were also £10 shares. They were represented by Mr. P. Ogden Lawrence, K.C., and Mr. Beebee. Council explained that representation orders had been made so that each was represented as a class. Then they got to a much larger class, namely, 250,000 5 per cent. preference shares of £5, who were represented by Mr. Jenkins, K.C., and Mr. Tomlin, the preferred holders, who represented £2,225,000, and the deferred shareholders, who represented the amount of £3,725,000, were represented by Mr. Frank Russell, K.C., Mr. Whinney, Mr. Younger, K.C., and Mr. Herbert Asquith respectively, and there were also 3½ per cent. debenture stockholders to the amount of £1,537,464. Pursuant to orders made by Mr. Justice Swinfen Eady, all the stockholders had now been paid 20s. in the £, the preference shareholders receiving in addition what was due to them for dividend. The way in which he could most conveniently put the matter before his Lordship was to deal with the facts in their historical order, as set out in the affidavits of Mr. Franklin, the liquidator. What was really material was, that there were two sets of capital. The company was formed in the year 1881, with a capital of £600,000 divided into 15,000 preference shares of £10 each and 90,000 ordinary shares of £5 each. It would be found that the ordinary shares in this company had from time to time been converted into stock of the preferred and deferred order. The preference shares were entitled to receive a preferential cumulative dividend of 6 per cent. and no more, and a preferential repayment of the amount paid up on each share, but no other participation in the profits. Some slight alteration was made in the holding, but it would be found that the preference shares remained substantially the same to the end. Clause 34 of the articles gave power to the board, with the assent of a general meeting to increase the capital.

MR. JUSTICE SARGANT asked whether the question would arise as to what were annual profits and what were not.

MR. DANCKWERTS thought not. He did not think that there would be any question as to the value received being annual profits after payment of all proper charges and outgoings. Clause 34 gave the power to create stock, and under it 15,000 second preference shares of £10 each were issued. They were preference as to dividend only when created in 1885, but in 1889 when the articles were changed, they were made preferential as regards capital also. They were entitled to a preferential dividend of 6 per cent., and after the ordinary shares had received a dividend of 6 per cent. out of the profits for the year, these second preference and the ordinary shares participated in surplus profits ratably in proportion to the amount subscribed on each share. On that clause there was a question whether surplus profits meant annual profits, and he believed the second preference and the preferred stock holders were going to contend on the assumption they did not; that they were entitled to this £200,000. These two classes claimed the right to divide the whole of the £200,000 between them.

MR. JUSTICE SARGANT said he understood that the deferred shareholders also claimed. Did not all the preference shareholders come in that claim?

MR. YOUNGER said that he was going to contend that these were not surplus assets at all, and the articles did not confer any right to profits on the second preference shareholders when the company was wound up. When the company was wound up the assets should be applied first in repaying the whole of the preference shares, and after that the preference shareholders had no claim to anything.

(To be continued.)

PARLIAMENTARY.

Rhondda Tramways Bill.

THE Bill promoted by the Rhondda Tramways Co. for the construction of a railless traction system, which has already passed the House of Commons, was before a Select Committee of the House of Lords last week, Lord Ribblesdale presiding.

MR. VESEY KNOX, K.C., for the promoters, explained that the proposed route would be a continuation of the present tramways from Williamstown South to Gilfach Goch and Nichols Terrace. It was proposed to give a half-hour service, and the fare would be only 8d., as against 2s. 3d. by train.

MR. TALBOT, K.C., who represented the Llantrisant Urban District Council, said he wished to make it plain that his opposition arose solely on the point as to the amount of contribution which the tramway company should pay for the upkeep of the roads.

MR. VESEY KNOX said that the House of Commons' Committee had decided that if the Urban District Council had to spend £4,000 or less on widening, the promoters were to pay one-third, and in addition they were to pay annually one-third of the extra cost of maintaining the roads, not exceeding three-eights of a penny per car-mile run. The promoters did not see why they should be singled out of all the users of the roads to pay. He asked the Committee to remove that clause from the Bill.

Replying to the CHAIRMAN, MR. VESEY KNOX said that if the figures regarding contributions were increased, the Bill would have to be abandoned.

After hearing evidence for and against the scheme, the Committee decided that the Bill should be allowed to proceed in its present form, but refused to give the Llantrisant Council powers to purchase.

Metropolitan Electric Tramways (Railless Traction) Bill.

LORD RIBBLESDALE'S Committee of the House of Lords have just concluded their consideration of the above Bill, by which the promoting company seek power to manufacture, provide and work trolley vehicles in Tottenham, Wood Green and Walthamstow. The Middlesex County Council appeared in opposition to the scheme.

MR. G. M. FREEMAN, K.C., who represented the promoters, explained that it was proposed to run vehicles on the railless trolley system along a route commencing in the Green Lanes at Turnpike Lane, Wood Green, through West Green Road across High Road, Tottenham, and along Broad Lane and Ferry Lane, Tottenham, to a point at the boundary of Middlesex and Essex. The route was a most important one, as it would give communication between Tottenham and Middlesex, and would be a great convenience to the travelling public. Certain difficulties had been encountered in connection with crossing over the River Lea at Tottenham and certain mains of the Metropolitan Water Board, but satisfactory arrangements had now been concluded.

After hearing considerable evidence, the Committee ordered the Bill to be reported to the House, with the addition of an agreed clause between the parties increasing the length of notice to be given to the local authorities of the company's intention to proceed with the works, from 12 to 18 months.

Mexborough and Swinton Tramways Bill.

LORD NEWTON'S Committee of the House of Lords were engaged several days last week in considering this Bill of the Mexborough and Swinton Tramways Co. for railless traction routes in the borough. The Bill, as already reported in the ELECTRICAL REVIEW, passed the House of Commons' Committee some weeks ago.

Evidence in favour of the scheme was given by MR. W. B. COWNIE, the managing director of the promoting company.

Evidence was also given in support of the Bill by a number of local residents, including representatives of the miners in the district.

MR. WEDDERBURN, K.C., who appeared for the Mexborough Urban District Council, appealed to the Committee not to pass the scheme, on the ground that if they did so it would prevent the local authorities coming forward with a comprehensive scheme more suited to the needs of the district than the present proposal. All along the local authorities had been opposed to the present Bill, and he was authorised to say that next year they would bring forward a better scheme, but if not Mexborough would do so alone.

After hearing a considerable body of evidence against the scheme, the Committtee found the preamble of the Bill proved.

Various Bills.—In the House of Commons, on Monday, the Kent Electric Power Bill was read a second time.

Metropolitan Railway Bill.—A Select Committee of the House of Commons, presided over by Sir F. Lowe, have approved the preamble of this Bill by which the undertaking is transferred to the Great Northern and City Railway Co. The Bill also provides for the extension of the line from Finsbury Pavement to Lothbury, to link it up with the Waterloo and City Railway.

City and South London Railway Bill.—Sir Francis Lowe's Select Committee of the House of Commons has passed the preamble of the Bill, by which the company are authorised to widen the tunnels to bring them into conformity with the other tube railways in London constructed at a later date.

BUSINESS NOTES.

The B. and K. Electric Restaurant.—We recently received from the BROMPTON AND KENSINGTON ACCESSORIES CO, LTD, of Earl's Court Road, London, S.W., specimen copies of the bill of fare of the "B. & K." Restaurant (close to Earl's Court Railway Station) where they do everything electrically, also of menu cards for tea, luncheon and dinner respectively. If only the "B. & K." can do a large enough traffic at the fares stated, shareholders in the B. & K. Electricity Supply Co. may feel the benefit in the shape of higher dividends, and some of the desirable West End residents whom we want to interest in electric cooking so that they will adopt it in their homes, may be won over. Electrical men should take note that it is part of the business of this restaurant to specially cater for luncheons and dinners, and a telephone message will reserve tables for parties or engage private rooms. Our readers will remember that all roads lead to Earl's Court Electric Restaurant, and we hope they will take an early opportunity of patronising the very excellent repasts prepared for them by Mr. R. S. Downe and his enterprising staff.

Catalogues and Lists.—MESSRS. W. H. WILLCOX & CO., 38, Southwark Street, London, S.E.—This is a very fine catalogue of 736 pages of illustrated matter describing all kinds of engineers' stores, tools and machinery. By the aid of a full index appearing at the front, you can easily find anything from acid to zinc, between these two coming a host of such various materials and manufactures as belting, barrows and boilers; calipers, cocks and cranes; dies, drills and dynamo brushes; engines, electricians' gloves and enamels, and so on all through the alphabet. There is no need to attempt to enumerate even a sufficient number of items to be a respectable representation of the vast host included in the book, for we believe most of our buying readers know how, for many years, Messrs. Willcox have made a speciality of the whole gamut of engineers' tools and stores. Prices appear to be given everywhere throughout this big and useful book.

MESSRS. HOGAN & WARDROP, 2, Gresham Buildings, Basinghall Street, London, E.C.—Illustrated leaflet describing their Calten's patent engine-room telegraphs, steering telegraphs, rudder tell-tales, and indicators for cranes.

THE CREDENDA CONDUITS CO., LTD., Chester Street, Aston, Birmingham.—12-page pamphlet containing illustrations, brief details and prices, of "Credenda" electric kettles, warming plates, cooking plates, boiling pots, electric irons, and stoves.

MESSRS. ERCOLE MARELLI & CO., 26, Garlick Hill, Queen Victoria Street, London, E.C.—Catalogue No. 8, I, giving very full tabular information, also descriptive matter, concerning the firm's centrifugal pumps driven by three-phase and D.C. motors. Notes on construction, installation and starting of pumps, friction in pipes, loss of pressure, weights and dimensions and prices of pumps are included. A separate pocket-size pamphlet describes the "Marelli" electric bolt for securing and opening doors and gates from a distance.

THE BRIMSDOWN LAMP WORKS, Kingsway House, Kingsway, London, W.C.—Folder giving latest prices of "Wirum" lamps.

THE ARMORDUCT MANUFACTURING CO., LTD., London.—Folder announcing that during the last few weeks seven municipal supply authorities have placed their annual contracts for "Armorduct" cables.

THE BLACKMAN EXPORT CO., LTD., 374, Euston Road, London, N.W.—Illustrated priced leaflet describing the Blackman inter-

mittent fan (1913 model), which is claimed to "create breezes which gently rise and fall as in nature." A description of the fan is given in our "New Devices" to-day.

MR. CHAS. H. BLUME, The White Buildings, Fitzalan Square, Sheffield.—Revised leaflet relating to "Megomac" and "Insulac" insulating varnishes and giving prices of same. Copies will be sent on application.

MESSRS. THOS. WHITTLE & SONS, LTD., Warrington.—20-page illustrated catalogue describing their Whittle patent endless link-grip belting, showing its application to driving different classes of machinery and giving a number of hints for users.

MESSRS. ALFRED HERBERT, LTD., Coventry.—Catalogue fully illustrating and describing the "Photostat" for quickly copying drawings, plans, documents, &c.

MESSRS. TURNERS AND MANVILLE, LTD., Hopetoun House, Lloyd's Avenue, London, E.C.—16-page pamphlet containing information relating to prices of their "Sindanyo" fireproof substitute for wood, slate, marble and fibre in electrical insulating service; also, for fireproof doors, cabinets, &c. We understand that owing to its high mechanical strength and high electrical insulating properties, the material—which is supplied in two grades: plain grade and ebony grade—is replacing slate and marble for switchboard panels in mines, and in places where moisture and rough usage are experienced.

THE EMANDA ENGINEERING CO., LTD., of Peckham, are bringing their name before the public by means of boxes of cigarettes.

THE ATLAS ELECTRICAL CO., LTD., 33, Tothill Street, Westminster, London, S.W.—Illustrated price leaflets respecting their "Atlas" carbon lamps, wires and cables, lampholders, switches, and other accessories; also wood blocks and switchboards.

THE GENERAL ELECTRIC CO., LTD, 67, Queen Victoria Street, London, S.W.—Price leaflets have been issued relating to the "Victor" electric bell, the "Santo" electric vacuum cleaner, and the "Defiance" electric flash lamp (pistol shape).

MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., Tyssen Street, Dalston, London.—Price list No. 9 (20 pages) contains illustrations, prices and other details, of a selection of fittings for semi-indirect and inverted illumination. The glassware used consists of opal, Holophane, ceonix and alabaster, and a number of inverted pendants and fittings in enamelled iron are also included. The designs include fittings suitable for small areas, private house, shop, office and station lighting, while several of the larger types of fittings are specially applicable for use in picture theatres, public halls, hotels, &c. Price list D 8 (20 pages) is devoted to illustrations with brief particulars and prices of a variety of electric signs including box, bracket, shop window, theatre, hotel, and ship signs. Thermal and mercury flashers and motor-driven automatic sign switches are also particularised. The majority of the signs listed can be supplied with either of the several patterns of glassware described in the list, but special reference should be made to oplex glass. Oplex (registered) glass panels are produced by a special process which enables a coloured ground to be "fired" on to a sheet of white opal glass. By this means the precise effect of duplex glazing is obtained by the use of one sheet of glass only. Oplex panels, therefore, enable the weight of the complete sign to be considerably reduced. Cloisonné and cloiglasic panels, although slightly more expensive in initial cost, are, we understand, effective for working out coloured designs or brilliant colour schemes. The firm will supply a copy of this list on receipt of inquiry.

Book Notices.—*Manual of Electrical Undertakings and Directory of Officials*, 1913-14, by Emile Garcke. London: Electrical Press, Ltd. 21s. net.—Christmas comes but once a year, but when this volume reached us recently we felt that "Garcke" came oftener. Of course, as a matter of fact, it does not do so, but those who use the *Manual* for ordinary non-financial purposes hardly know when it gets out of date, so they do not wonder when the new one is coming along, as they do in the case of some reference books. It comes at the middle of the year, when most people are beginning to think about holidays, and, not being "light" literature in any sense, it is preserved for reference when in deeply serious mood, the reader having recognised of old that it is one of those books of which much study is a weariness to the flesh. Fancy taking "Garcke" to read on a holiday train journey! It is even difficult to write a review of a book of this kind this weather, and one dozes off dreamily after noting again that the statistics regarding the finances, &c., of companies, undertakings and firms, bring one down to so recent a date as March or June last year, and, in some cases, even the end of the previous year. The compiler does not claim this as a merit, and, of course, it is in no way his fault, or the fault of his staff. No doubt the date of publication, and the failure of those responsible for sending in information, are two of the reasons. However, most of the later information regarding these undertakings can be obtained from the files of the ELECTRICAL REVIEW, or from the directors' reports or engineers' reports and accounts, if these happen to be at hand. But, putting aside this point, disappointing as it must be both to editor and user, the *Manual* is really a most valuable publication. Indeed, for statistical matter other than mere general and central-station information of a purely directory character, it is *par excellence* the book of the year, and if we did not think that most of our readers already knew nearly as much as we do ourselves about it, we would enter into a detailed recital of its sections, classifications, maps, and numerous other features. As it is, all we need now remark is that good wine needs no bush, and a "Garcke" up to date is worth two of last year.

Year-Book of Wireless Telegraphy and Telephony. London: Marconi Press. Price 2s. 6d. net.—This encyclopædic volume differs widely from one's usual conception of a year-book, containing as it does a number of articles of the "text-book" class by such authorities as Fleming, Erskine-Murray, Sankey and Eccles, to pick a few at random from the contributors. No attempt is made to frame these articles in the terse phraseology to which one is accustomed in year-books. In fact, the work is a species of encyclopædic text-book rather than an elaborated pocket-book. Whether this is altogether wise is doubtful. Will, or can, the layman read these articles intelligently? And, on the other hand, can the expert wait for a year-book to find information of this nature, and will he look for it there, anyhow? The descriptive matter should be curtailed, and rather more of that dry-as-dust, but indispensable, matter included, which it is at present difficult to obtain elsewhere. Possibly it is the publishers' intention to follow this course in subsequent issues—making this edition an introductory manual. No one could cavil at the value given in the present work, but it would certainly have been better if the name Marconi had appeared in the title, for the bulk of the matter presented is exclusively Marconic. Following a calendar is a chronological record of progress since 1896. Most technical readers will wish that this list had been extended backward to a few years prior to 1896. In justice to the early workers in the field, this should be done, and taken as a whole, the record should be amplified and made more readable. The administrative section of the volume, containing the findings of the 1912 Convention and the wireless laws and regulations of the principal countries in the world, is most important, and would alone be worth, to many readers, more than the price asked for the whole volume. The complete list presented of land and ship stations, with their wave lengths, ranges, call letters, hours and nature of service, and charges per word (in the case of public stations), is supplemented by a large map of the world showing existing, and a number of proposed stations. A glossary of technical terms in English, French, German, Spanish and Italian, and a collection of technical data and formulæ, are other valuable features to which attention must be called. Illustrated biographies are given of a number of wireless experts. The book is excellent value, and it is to be hoped that it can, and will, be published annually.

The Uses of Electricity. Part I, Electric Lighting (price 1d.); Part II, Electric Cooking and Heating, &c. (price 2d.); Part III, Works Driving. London: Kilowatt Publishing Co., Ltd.—These three booklets are published for the purpose of explaining to consumers the various applications of electricity, and the manner in which electricity supply may be utilised to the best advantage. The first, after briefly explaining the convenience, healthfulness and economy of the electric light, gives hints as to the best disposition of the lamps, describes the various modes of wiring houses and shops, and gives useful advice on shop and window lighting. Part II contains an article on Electric Cooking by Messrs. A. Hugh Seabrook and H. H. Holmes, whose names alone vouch for the value and interest of the information given; other articles deal with electric irons, radiators, vacuum cleaners and various domestic applications of electric heating. The third booklet, by Messrs. H. H. Couzens and F. Farndon, is devoted entirely to the use of electric power in works, with some illustrations of motor drives, and comparative figures of cost. A few letters from users who enthusiastically endorse the claims of the advocates of electric power are inserted with telling effect. These booklets should prove useful to central-station engineers, contractors and others interested in the development of the electrical industry.

Wade's Tables for Wooden Poles. Hull: Richard Wade, Sons and Co., Ltd. Price 2s. 6d.—The reduction of the wind pressure in the Board of Trade Regulations from 30 to 25 lb. has necessitated the revision of the tables issued by Messrs. Wade, whose customers can obtain copies free on application. The book is an excellent time-saver for engineers about to erect overhead lines, as it contains 16 tables, giving in great detail the standard sizes of telegraph poles, the wind-pressure on high-pressure overhead power lines and poles for a wide range of conditions, sizes of single and A poles for power lines, similar data for telegraph lines, the gross safe loads that may be applied to poles, and the elastic deflection of wooden telegraph poles, with explanatory remarks. There is no superfluous matter, and the advertising element is hardly discoverable.

The Modern Bioscope Operator. London: Ganes, Ltd. Price 3s. 6d.—Since its first appearance in 1910 this manual has arrived at its third edition, and has been revised throughout. Naturally a large proportion of the work is devoted to the electrical apparatus, which is described in detail, with clear instructions as to the handling of the various parts. As we said in our review of the second edition, the book can be confidently recommended to bioscope operators, as well as to contractors concerned with the installation of electrical apparatus in picture theatres. The text is very good; it would be an advantage if it were more fully illustrated. We believe there is not a single view of an arc projector (except in a diagram) or of a motor-generator in the book.

Logarithms for Beginners. By C. N. Pickworth, Wh.Sc. London: Whittaker & Co. Price 1s. net.—This handbook, now in its fourth edition, is designed to help the tiro over the difficulties usually met with in the use of logarithms, and gives numerous worked examples as well as problems, with answers. Tables of four-figure logs and antilogs, and hyperbolic logs, are included.

Engineering Tables and Data. By W. W. F. Pullen, Wh.Sc. Manchester: Scientific Publishing Co. Price 1s. 6d. net.—This is the third edition of a useful little collection of tables for use in the laboratory and drawing office. The latest data for steam are included, in °F. and °C. Rules for mensuration, mathematical tables and data, and standard integrals are given.

"Polytechnicum" is the name of a new Spanish-American technical review, dealing with science and industry; it is published monthly by Nicolas M. Rivero, 7, Pral, Madrid: annual subscription, 18 pesetas, in Spain. It is a high-class journal, well printed

on good paper, and contains a variety of articles of engineering interest.

"*Journal* of the Institution of Electrical Engineers." Vol. LI, No. 220. London: E. & F. N. Spon, Ltd. Price 5s. The issue for June, 1913, contains the following papers:—"Power Supply on the Rand," by A. E. Hadley; "Self-Synchronising Machines," by Dr. E. Rosenberg; "Independent Steam Condensing Plants," by W. A. Dexter; "Applications of Electricity on Warships," by A. P. Pyne; "Electric Heating and Cooking," by T. P. Wilmshurst; "Economies in the Use of Electric Power," by W. E. Milns; "Deposits in Oil-Cooled Transformers," by Dr. A. C. Michie; "Improvements in Continuous-Current Meters," by W. E Cooke; "Air-Cooled Jacketing in Hollow Walls by Electric Fans," by J. W. Meares.

"*Journal* of the American Society of Mechanical Engineers." July, 1913. New York: The Society. Price 35 cents.

"*Transactions* of the New York Electrical Society." No. 4. 1913. Easton, Pa.: The Society.

"School of Mines Quarterly." Vol. XXXIV, No. 4. July, 1913. New York: Columbia University. Price 50 cents.

"The Physical Review." Vol. I, No. 5. June, 1913. Lancaster, Pa.: The American Physical Society.

"The Selection of Explosives Used in Engineering and Mining Operations," by C. Hall and S. P. Howell; "Coal Mine Accidents in the United States, 1896-1912," by F. W. Horton; "National Mine-Rescue and First-Aid Conference, Pittsburg, Pa., 1912," by H. M. Wilson; "The Commercial Trend of the Producer-Gas Power Plant in the United States," by R. H. Fernald; "Monthly Statement of Coal Mine Accidents in the United States, January and February, 1913." by F. W. Horton; "Wastes in the Production and Utilisation of Natural Gas and Means for their Prevention," by R. Arnold and F. G. Clapp. 1913. Washington: Government Printing Office.

Lead.—The market continues to exhibit firmness, which finds but little reflex in other sections of the metal trade, and which sufficiently demonstrates the soundness of the position. While the imports for the first half of the year showed a reduction compared with 1912 of about 2,700 tons, the exports increased by 4,100 tons, so that the quantities available for the home trade were actually nearly 7,000 tons deficient compared with a year ago. The June imports, indeed, show an alarming falling-off at 13,362 tons compared with 16,224 tons last year and 20,455 tons in 1911. The total imports for the six months were 104,779 tons against 107,445 tons in 1912 and 106,922 tons in 1911. While there has not been so much anxiety on the part of consumers to purchase spot and prompt deliveries, the supplies available remain of a restricted character, and any renewal of the demand would certainly leave its mark on prices, which stiffen whenever a buyer comes forward. With consumption proceeding on a satisfactory scale, and the prospect of short supplies from Mexico, where, although things are mending, the improvement is very gradual, there can hardly be much difficulty in maintaining prices, the more so as lead at present differs from most other metals in that there are not any stocks to be financed. It is the problem of finance which has been the dominant factor in many commodities lately, and wherever there have been surpluses to be nursed, the reaction in prices has been rather severe. It was finance that brought about the liquidation of tin by the large Continental holders, and which has caused a drop in prices of unparalleled severity from £232 a ton early in May to £177 last week with hardly even a momentary reaction. Lead will probably keep quite a good market until the signs become apparent of a radical alteration for the better in Mexico, but even with this the price of lead for near delivery might remain at a comparatively high figure. The demand from the electrical trades is better than that from the rollers, the latter, in fact, being rather indifferent for the time being.

The average price for June was £19 10s. 8d. against £18 14s. 3d. for May, and £17 11s. 7d. in June, 1912, and £13 5s. 5d. in June, 1911. The highest average last year was £21 8s. 11d. in September.

In their report dated July 12th, MESSRS. JAMES FORSTER & CO. state:—"As we anticipated, of the large quantity of lead arriving this week, little or none of it has come on the market; much of it has been shipped abroad and to provincial ports, the remainder relieving the necessities of local consumers. Monday's market opened easier, July lead selling at £19 7s. 6d. to £19, and August at £18 17s. 6d. Since then £19 15s. has been paid for prompt lead, £19 10s. for July, £19 for August, and £18 10s. for September. At the close prompt lead is a little easier at £19 10s., after £19 7s. 6d., with buyers for August at £19, September at £18 12s. 6d., and October at £18 7s. 6d., after £18 5s. There is a good inquiry for forward, for export and home consumers. The strength of the position is shown by the fact that lead alone has remained firm, in face of a heavy fall in other metals during the week. Lead is wanted for export and by the home trade, and there is not too much coming in, so that we anticipate a steady market with more pressure for early lead. English lead £19 15s."

Edison Cars.—The Mayor of Blackburn, Alderman S. Crossley, has used an Edison electric car in his attendance upon his Majesty the King during his recent visit to the borough of Blackburn.

Works Closed for Holidays.—The works of MESSRS. MAWDSLEY'S LTD., of Dursley, Glos., will be closed from the evening of Friday, August 1st, until Monday morning, August 11th. Only urgent correspondence will be dealt with during this period.

MESSRS. A. P. LUNDBERG & SONS, of Liverpool Road, N., announce that their works will be closed from Saturday, August 2nd, until Monday, August 11th, for the employés' annual holidays.

Consular Reports.—Spain.—The French Consul at Santander calls attention to the growing importance of the importations of electrical material into the region behind this port, owing to the substitution of electricity for steam in various local industries. This movement is favoured by the wealth in water power of this region, inducing such installations as that at Artillero, in the middle of the Santander mining field, where the Societá Electra de Viergo has built a large generating station, supplying three-phase current at 220 volts and a periodicity of 50. Six years ago none of the mines in the province made use of electricity, whereas last year 67 motors of a total of 3,024 H.P. were employed, 46 motors of 2,119 H.P. by iron mines and 21 motors of 905 H.P. by zinc mines, in the extraction, washing and transport of ore. Noteworthy among these installations are that at Camplemento, 350 H.P.; the Heras Mines, 350 H.P.; the San Salvador Iron Ore Co., 300 H.P.; the Entrambasaguar Mines, 100 H.P.; the Cartes Mines, 100 H.P.; and the Cabariéna, 50 H.P. Among local industries in Santander and its neighbourhood which have substituted electricity for steam may be named the Société Générale des Cirages Francais; the engineering works of Corcho Sons, San Martin, Lavin & Co.; the petrol and oil refinery of Deutsch & Co., and the Austriaca and the Cruz Blanca breweries. Other establishments, such as the soda works of the Societá Solvay at Baneda, and the Nueva Montana Ironworks Co. (which likewise supplies current to the Societá Cementos de Portland and to the tramways of Santander) produce their own motive power. There are, besides, a variety of minor industries—such as chocolate factories, bakeries, &c., whose numbers are daily growing, making, or about to make, use of single motors. The importations of electrical material into Santander during 1912 were as follows:—

Dynamos and motors of less than 100 kg.	9 638 kg.
" " of 101 to 400 kg.	10,541 kg.
" " above 400 kg.	99 562 kg.
Switchboards less than 400 kg.	14 769 kg.
Accumulators	2,903 kg.
Conductor cables above 0·01 cm.	5 034 kg.
" less than 0·01 cm.	265 kg.
Telegraph and telephone apparatus	2 652 kg.
Arc lamps	99 kg.
" carbons	15 kg.
Fitted electric bulbs	1,261 kg.

The Consul points out that only one case is known of French firms supplying the equipments of any of the mines cited, that of the mines of Heras, by the firm of Fabius Herion, of Nancy, and one English firm, which furnished the equipment of the mines of San Salvador. The bulk of the installations, as also of the imports, are furnished by German houses, owing more to the superiority of their commercial organisation than to the superior quality of their goods. The two powerful firms who represent the German electrical industry in Spain have created two Spanish branches, with stocks of types in different sizes, thus offering to the purchaser the greatest facilities in drafting plans, with rapid delivery. They have even established engineering works, which are in reality only erecting shops for the material imported from Germany. Moreover, they push their goods by advertisement in local journals to the utmost. In conclusion, the Consul tenders the following advice: It is needful to have on the spot active and intelligent agents, knowing Spanish and furnished with sufficient power to negotiate without delay; catalogues should be clear and detailed, and allow of settling schemes of installations by their information alone; there should be local stocks kept, if possible, of types constructed in graduated sizes; delivery of orders should be prompt and facilities offered for payment. Publicity should not be starved.

Japan.—The following information is from the report by H.M. Commercial Attaché at Yokohama (Mr. E. F. Crowe) on the trade of Japan in 1912, which will shortly be issued:—

The business in insulated wires has continued very large, the value of the imports in 1912 amounting to no less than £571,000. Of this the bulk came under the tariff heading, "Armoured with metal, other than submarine," and the United Kingdom and Germany divided this between them, each taking about £250,000.

At present, to the traveller who is paying his first visit to Japan, one of the most striking things is the appalling amount of wires which criss-cross over the streets of the large cities. This is gradually being done away with and underground wires substituted, and until the process is completed the imports from abroad will remain fairly large.

The other chief reason for the increase in the imports of this class of goods is the demand from the hydro-electric power companies. Although the Japanese electric wire works have developed to a considerable extent during the past few years, they are as yet unable to produce satisfactory high-tension cables.

Electrical Exhibition in Spain.—The scheme of organising an International Electrical Industry Exhibition in Barcelona is going ahead very rapidly. It has been decided that it shall be held in the Palace de Bellas Artes y Salon de San Juan in the autumn of 1914, and that to render it suitable for all classes of exhibitors, continuous current at 110, 150, 220 and 300 volts, as well as three-phase high-tension current, shall be available.

Dissolutions and Liquidations.—PRESTED MINERS' GAS-INDICATING ELECTRIC LAMP CO., LTD.—A petition for winding up this company, presented by Messrs. George Reynolds, Ltd., of Stepney Green, London, is to be heard on July 22nd.

ANGLO-NORWEGIAN ALUMINIUM CO., LTD.—Creditors must send particulars of debts, &c., to the liquidator, Mr. F. C. Potter, 28, Victoria Street, S.W., by July 25th.

Rubber Exhibition in London. — We have received from MR. A. S. MANDERS (75, Chancery Lane, W.C.), the managing director, particulars of the International Rubber and Allied Trades Exhibition, which will be held in London at the Royal Agricultural Hall, from June 24th to July 9th next year. As the name of this event implies, it will not be a purely rubber show like that run under Mr. Manders's guidance in 1911, but it will throw open its doors to cotton, fibres and other tropical agricultural products as well. The Exhibition will be under the patronage of His Majesty the King. In addition to the promotion of trade and commerce, it should also afford opportunities for producers, manufacturers, chemists, scientists, makers of machinery and others to meet and interchange ideas. Between the opening and closing dates, the International Conference of Tropical Agriculture and the Fourth International Rubber and Allied Industries Conference will be held in the Exhibition building. There will be special lectures and demonstrations, and moving-picture shows of production, packing, shipping and manufacturing of crude products. There will be a number of trophies and prizes for competition. Copies of the prospectus can be obtained from Mr. Manders.

The Lighting of an Indian Public Garden.—The "Eden Gardens," often described as the Hyde Park of Calcutta, and the fashionable society *rendezvous* when the band is playing, are under the control of the Public Works Department. For some time the illumination has been by means of arc lamps, but these have been recently replaced with 600-C.P. Osram lamps, which have been fitted in cast-iron water-tight fittings, the arc lamp poles still being utilised.

Trade Announcements.—The address of the Sheffield Branch of the BRITISH THOMSON-HOUSTON CO., LTD., will, after August 1st, be 8, East Parade, Sheffield, instead of as at present, 41, Church Street, Sheffield.

MORRIS & LISTER (LONDON), LTD.—The company's telephone number, which is not yet in the telephone address book, is 5134 Kensington.

THE WHARRAD ENGINEERING CO., which commenced business at Victoria Street, Redditch, a year ago, for the manufacture of small steel parts, motor accessories, &c., found removal to larger premises necessary six months later, and a site has now been taken on Hewell Road; the erection of new works is proceeding.

Owing to increased business, THE IMPERIAL LIGHTING CO. have taken larger premises, and in future their address will be:—2, 4 and 6, Pocock Street, Blackfriars Road, S.E. Their various workshops have modern equipment for the manufacture of every description of electric signs, electrical stage equipment, and Fairyland strip. New telephone number: "3931 Hop."

F. and S. Ball Bearings.—The Gnome engine used in the recent flight of Mr. Brindejonce in the Paris, Berlin, Warsaw, &c., circuit back again to Paris, was fitted exclusively with F. and S. ball bearings.

Bankruptcy Proceedings.—WYNDHAM WADSWORTH, engineers' agent and dealer in electrical accessories, 16, John Dalton Street, Manchester.—Receiving order made July 9th, on a creditor's petition.

T. A. FLATHER, electrical engineer, Leeds.—Bankrupt discharged on June 9th conditionally.

FREDERICK JOHNSON, electrical engineer, 60, Eltisley Avenue, Newnham, Cambridge.—Receiving order made July 12th on a creditor's petition.

LIGHTING and POWER NOTES.

Australia.—During the year to December 31st last, the Melbourne City Council sold 14,774,000 units, its consumers numbered 5,419, and its total connections 15,124 KW. at the end of the year. The latter figure includes 6,935 KW. of lighting, 6,705 KW. of power, and 1,484 KW. of heating. Large extensions of plant have been made and authorised recently, including four boilers, one 2,500-KW. Belliss-Siemens and two 4,400-KW. Willans-Siemens turbo-alternators; a 1,000-KW. and four 1,500-KW. Westinghouse rotary converters, this plant being in connection with the 6,600-volt three-phase system which it is expected will be brought into use next month, when the Municipalities of Brunswick and Port Melbourne will be supplied.

The W.A. Government has accepted tenders for three 3,000-KW. Willans-Brown, Boveri turbo-alternators for the new Perth power station. The Perth Council's electricity and gas supply department shows a net profit of £11,137 for the half-year, of which £5,250 has been appropriated for sinking fund. The net balance on the undertaking, after meeting financial charges, since it was taken over by the Corporation in February, 1912, amounts to £20,804.

Owing to the bursting of a main steam pipe at the Melbourne Electric Supply Co.'s power station at Richmond recently, many suburban streets and houses were left in darkness, and the local tramways were stopped for about five hours.

Boston.—Messrs. Crompton & Co., Ltd., have informed the R.D.C. that they intend applying for a prov. order for electric light in Skirbeck Quarter, Wyberton, Brothertoft, and from Wrangle to Skirbeck inclusive.

Bath.—ANNUAL ACCOUNTS.—At a meeting of the E.L. Committee, the detailed accounts for the year ended March last were presented. They showed a deficit on the year's working of £1,445, compared with £1,521 in the preceding year. For the 12 months the total revenue was £22,130, compared with £21,247 in 1911-12. The income from private lighting was £11,906, against £11,477, an increase of £429; from power and heat, £4,401, against £4,001, an advance of £400. Public lighting brought in £200 more, and in other sources of income the increase was £73, making a total advance of £1,161 compared with the previous year. Expenditure went up, the total expenses being £11,846, against £11,329; an addition of £677 was due to the increased cost of coal. The gross profit was £366 more than 1911-12, but £331 of this was absorbed for interest on additional loans, and £81 for an additional sinking fund payment, leaving the net deficit as stated.

Barrow-in-Furness.—WORKHOUSE LIGHTING.—The B. of G. has passed a resolution that the electric light be installed at the workhouse and infirmary at a cost not exceeding £750.

Barwell.—The Midland Electric Light and Power Co., of Leamington, has informed the local authority that it intends applying for a prov. order for electric light for Barwell and other parishes. At the present time the Leicestershire and Warwickshire Electric Power Co. and the Parish Council are in negotiation as to terms for public lighting by electricity.

Bedford.— DIESEL ENGINE LOAN.—Regarding the recent inquiries into the application of the T.C. for a loan of £11,590 for electricity purposes, the L.G.B. has informed the Council that "in view of the facts ascertained by the Inspector at the inquiry," the Board is not prepared to sanction the loan of £9,790 for the purchase of a Diesel engine, &c. At the same time sanction to a loan of £1,800 for services was forwarded. The E.L. Committee is considering what steps shall be taken in the matter.

Belfast.—The Tramways and Electricity Committee is to ascertain from the Harbour Commission the terms on which the site for a generating station on the harbour estate could be obtained by the Corporation.

Beverley.—At a meeting of the T.C. on Monday, notification was received from Messrs. Foote & Milne, of London, of their intention to apply to the B. of T. for a prov. order for electric light.

Bradford-on-Avon.—Mr. J. H. Edwards has informed the U.D.C. that he intends applying to the B. of T. for a prov. order for electric light.

Brandon (Co. Durham).—The U.D.C. has decided to have the new hospital lighted and heated by electricity.

Bradford.—The Chamber of Trade is not satisfied with the response made by the Corporation to its request for a reduction of the electricity charges to shopkeepers to ½d. per unit, and the adoption of a system of cash discounts on accounts, instead of the existing system of free lamp presentation. A speaker admitted that some of the suggestions of the Corporation were good; he did not, however, think the rateable value system at all fair.

The Corporation, it is understood, considers the Pudsey Gas Co. unreasonable in its dealings with the Corporation in regard to the supply of a certain amount of gas for street lighting in the district between Bradford and Leeds, and the decision of the Corporation to light some of the streets in the Thornbury district by electricity is looked upon as a hit back. It has often been threatened that similar action will be taken against the Drighlington Gas Co., who supply some gas at Tong.

Bury St. Edmunds.—The working of the electricity department for the last year shows a net profit of £20.

Bushey.—The U.D.C. has received intimation that prov. orders for electric light are to be applied for by the Watford U.D.C. and the Colne Valley Electric Supply Co., Ltd.

Cheshunt.—The U.D.C. having declined to establish electricity works on the ground that it would involve too great an expense to the ratepayers, the Traders' Association has decided to request the Council to reconsider the matter.

Carnarvonshire. — The National Electric Construction Co. has secured the contract for electric lighting at Madryn Castle, and is carrying out the lighting of Carnarvon Workhouse and Bangor New Workhouse Infirmary.

Continental Notes.—BELGIUM.—A colliery company —La Société des Charbonnages des Quatre-Jean, of Quene-du-Bois —has submitted the lowest tender to the municipal authorities of Romeèe (province of Liége), for the concession for the supply of electrical energy for lighting and power purposes in the town, quoting 13 centimes (about 1·3d.) per KW.-hour, for a high-tension supply.

FRANCE.—La Société Hydro-Electrique des Basses Pyrenées has just entered into a contract with the Société Concessionnaire de l'Eclairage Electrique de Biarritz, to supply the necessary electrical energy for the lighting of the town of Biarritz. At present single-phase alternating current is being supplied, but this is to be altered to triphase.

Cornforth.—The P.C. has decided to approach the Cassop and Coxhoe Parish Councils and Messrs. Bell Bros., Ltd., with the object of obtaining a supply of current for the combined district for public lighting

Crewe.—The abstract of accounts show that in the electricity department, notwithstanding increased cost of fuel and other materials, there was a surplus of £1,199 on the last year's working. Receipts from the sale of current, public lighting, &c., amounted to £8,744, and from interest £198. Working expenses were £4,506, and loan charges £3,237. To relief of rates £600 was contributed, and a further £740 was placed to the reserve fund.

Dromore.—STREET LIGHTING.—The Council has accepted the tender of Messrs. Allen & Grosse, Belfast, for electric street lighting at £124 for the season, and 11 lamps of 200 C.P., 17 of 50 C.P. and 48 of 25 C.P. are to be erected. The tender was in competition with gas and oil lighting.

Ealing.—The L.G.B., respecting the application of the B.C. for sanction to borrow £4,000 for the purposes of extending the Town Hall, providing, in particular, for increased accommodation for the electricity department, has replied that the proposals were generally satisfactory, but that it proposed to defer its decision till tenders had been obtained. The borough surveyor is to advertise for tenders at once.

Edinburgh.—ANNUAL ACCOUNTS.—According to a report by the Corporation's electrical engineer, during the last year of working, 17,047,645 units were sold as follows:—For lighting, 9,861,180; power, 5,095,656; public street lighting, 1,959,548; and for traction, 131,261. This is an increase of 830,224 units. Power showed an increase of 16½ per cent. During the year the motors connected amounted to 783 H.P., making a total of 12,186 H.P. In the revenue account there was an income of £131,678, and a credit balance of £2,179. Working expenses totalled £67,509; interest, £18,709; and sinking fund, £41,225.

The Electric Lighting Committee received a deputation regarding the rates charged for current to city picture houses for projector purposes. Mr. N. A. Paton, Glasgow, electrical adviser to the Cinematograph Exhibitors' Association, and others, contended that the current used for projector purposes should be charged at power rates instead of at lighting rates, as was done at present. Concessions had been granted in other towns, and particularly in Glasgow, where there was a flat rate of 1½d. per unit for all current used for projector purposes. The Committee promised to give the matter its consideration.

Goole.—The Gas Committee has received a demand from the Aire and Calder Navigation, as the largest consumers of the gas of the undertaking, for an additional allowance of discount, accompanied by a threat that otherwise the Navigation would seriously consider the adoption of electricity. It is understood favourable terms have been offered by the Yorkshire Electric Power Co.

Havant.—The R.D.C. has received notice that a private company is to be formed to apply to the B. of T. for a prov. order for electric lighting in the Council's area.

Hove.—The T.C. has appointed a Committee to consider and report as to the relative advantages and disadvantages of the various methods by which, under the provisions of the Corporation Bill, 1913, or otherwise, electric light can be supplied in the borough.

Hereford.—The R.D.C. has granted the T.C. permission to supply current in the parish of Holmer, on condition that the Corporation takes no steps to include the parish in the city boundary at any future time.

Hetton-le-Hole.—PUBLIC LIGHTING.—The U.D.C. has asked the Newcastle-on-Tyne Electric Supply Co. to submit terms for public lighting by electricity, both by means of overhead and underground cables.

Heywood.—A Sub-Committee has been appointed to consider and report upon terms offered for the supply of electricity in bulk to the Corporation. At a meeting of the T.C. on July 9th it was stated that the matter could not yet be reported upon.

It was mentioned at the T.C. meeting that a considerable amount of money would have to be spent shortly on the battery, and that the cable in Bamford Road would have to be replaced by a new one.

Huddersfield.—WORKHOUSE LIGHTING.—The B. of G. has decided to engage an expert to report with reference to the substitution of electricity for the present system of illumination by gas at Crosland Moor workhouse.

Hunsworth (Yorkshire).—STREET LIGHTING.—The D.C. last week agreed to prepare a statement of the cost of the street gas lighting of the whole district for the past 12 months, with a view to asking the Bradford Corporation how much it would charge to light the streets by electricity, and comparing the two costs.

Ilford.—The U.D.C. has under consideration the question of installing electric baths.

Kendal.—LOAN SANCTION.—The T.C. has received from the L.G.B. sanction to loans of £800 for mains, £100 for services, and £100 for meters.

Kenilworth.—At a meeting of the U.D.C. on July 8th, notice was received of the intention of the Midland Electric Light and Power Co. to apply for a prov. order for electricity. The Council referred the matter to a committee.

Keighley.—The Borough Education Committee has decided to have the E.L. installed at the Education Offices.

Kirkcaldy.—In the Corporation electricity department, the gross profit carried to net revenue account for the last year, was £3,712, or 4·8 per cent. of the capital expenditure, as against £3,313, and after payment of interest and sinking fund charges, there was a net deficit of £26 on the year's working. During the year the sale of current for private lighting increased by 10·64 per cent., and for motive power by 31·43 per cent. In the tramway department the gross profit carried to net revenue account was £6,158 (or 6·4 per cent. of the capital expenditure), as against £6,089 last year, and after payment of interest, sinking fund and depreciation, there was a net profit of £1,370.

Ladysbridge.—The Banffshire Lunacy Board has received an offer of £1,068 from Anderson & Munro, Ltd., for wiring the asylum. Before this offer is accepted, an independent electrical company is to be consulted in regard thereto.

Littleborough (near Rochdale).—The U.D.C. has decided at a special meeting to extend the mains and to apply to the L.G.B. for sanction to borrow £3,000 to carry out this work and other extensions in the future.

Liversedge.—The U.D.C. has passed plans for a new sub-station to be erected off Valley Road by the Yorkshire Electric Power Co., Ltd.

Leigh (Lancs.).—ANNUAL ACCOUNTS.—During the last year's working 1,086,297 units were sold, or 58,000 more than in previous year. The total revenue was £9,347, and the gross profit £4,544; and after meeting all charges, a net surplus of £1,080 remained, being the largest so far obtained. Expenditure on both fuel and water was reduced, as compared with the previous year, due largely to the introduction of more modern condensing plant. The borough engineer, Mr. A. T. Smith, urged his Committee to create a renewals fund from the surplus money in hand, and £1,261 was transferred for this purpose.

London.—BETHNAL GREEN.—The Council has accepted the offer of the Stepney B.C. for the supply of electricity in bulk, but the terms of the agreement are stated to be not definitely settled.

BERMONDSEY.—ANNUAL ACCOUNTS.—The Electricity and Street Lighting Committee of the B.C. has submitted the annual accounts for the past year. The total units sold were 4,582,155, an increase of 552,995 over the previous year. The total income, £27,196, showed a gross profit of £12,779, which was 6½ per cent. on the capital expenditure. The net surplus balance, after crediting special items, and making provision for £924 to meet accrued proportion of loan charges due to date but not paid, was £80. This small surplus on the year's working was due to various causes, amongst which may be mentioned (*a*) the extra expense caused by the increased price of coal owing to the strikes; (*b*) a slight fall in the expected increased revenue; (*c*) a larger proportion of the first instalment on the last loan came into the financial year than was anticipated; and (*d*) reduction in the loan period. Notwithstanding the higher price of coal, the total working costs per unit were reduced from ·7d. to ·67d., and the undertaking was still the fourth lowest in London, including the companies.

The Finance Committee, in commenting on the accounts, points out that the surplus estimated 12 months ago was £1,546, whereas it was found to be at the close of the year only £79, and this on a capital expenditure of nearly £200,000, of which £165,000 was still outstanding. The units sold for street lighting were 545,854, thereby showing a profit of £900. A further profit made by the sale of current to the Council's various buildings and works was included in the sales to private consumers, and the accounts, as presented, did not permit the amount of this additional profit to be stated. It had previously pointed out that caution should be exercised in fresh borrowings, and now repeated and emphasised that advice, and suggested that no fresh loans be sanctioned unless a sufficient price be obtained from private consumers to put the undertaking upon a paying basis. The charge for street lighting and other services connected with the Council should be in close relationship to the cost price.

SHOREDITCH.—PROPOSED PLANT EXTENSIONS.—The Electric Lighting Committee has approved an important scheme of extensions, involving the provision of buildings at Whiston Street, suitable for 10,000 KW. of additional plant. One 5,000-KW. set is proposed to be installed before March, 1915, and a similar one in the following year. It is proposed to dispose of five dryback boilers and two Willans generating sets at Coronet Street, in order to provide space for rotary converters for the H.T. supply. The Committee considers also that negotiations should be at once opened with the Stepney B.C. for a trunk connection with that Council's generating station to give at least 1,500 KW. stand-by supply, and the first plant to be provided should be the rotary converters at Coronet Street and Whiston Street stations. A summary of the cost shows expenditure on buildings, foundations, &c., £22,800; on turbines, boilers, pumps, pipes, &c., £56,050; on H.T. mains and switches connecting Whiston Street and Coronet Street stations, £5,000; on rotary converters, £10,000; and on the Stepney trunk connection £5,000, making a total of £98,850. The additional loan charges will not have to be fully met until 1916-17; they are estimated at £7,817, and against this the borough electrical engineer considers that the saving in fuel cost will amount to some £5,000. The balance of the loan on the plant which is to be disposed of will be met from the reserve fund.

SHOREDITCH.—ANNUAL ACCOUNTS.—The accounts of the electricity undertaking show that during the year ended March 31st last the income from the sale of current amounted to £58 815, as compared with £54,355 in 1911-12, an increase of £4,460. The number of units sold was 8,774,653, against 7,896,710. The average price obtained per unit was 1·60d. per unit, instead of 1·65d., owing to the system of discounts adopted by the Council 18 months ago, which has reduced the price for power purposes. There was an increase of 23 per cent. on the cost of coal during the year, which had the effect of reducing the gross profit for the year by £1,639, in comparison with the figures for 1911-12. The charge for supplying electricity to public arc lamps again showed a reduction, the cost being £4,869, as against £5,337 for 1911-12. After meeting all charges for interest and repayment of loans, &c., there was a surplus of £3,728, to which must be added the balance brought forward, £195, making a total of £3,923, and this is to be disposed of as follows: Transferred to reserve fund account, £3,500; to change of pressure account, £369; carried forward, £54. The current generated from destructor steam during the 12 months was 715,823 units, of the value of £1,461, the comparative figures for 1911-12 being 729,745 units, and £1,167.

FULHAM.—NEW GENERATING PLANT.—The Electricity Committee reports having had under consideration the necessity for further extensions to the generating plant at the borough electricity works. The plant at the present moment, the report states, consists of slow-speed horizontal engines, high-speed vertical, and the turbo machines, with a total capacity of 4,450 KW. Shutting down one set (say of 1,500 KW.) for even one night, would leave the station with two Musgrave sets of only 600 KW. capacity as a stand-by. Having regard to the increasing load on the mains, the Committee considers it desirable to at once install an additional turbo-alternator of 2,500 KW. capacity. With regard to alternative suggestions for the provision of engine-room accommodation, it will be in the best interests of the undertaking to adopt one which provides for the taking out of the two Musgrave sets which occupy practically half of the existing engine-room, and which would provide space for three 2,500-KW. turbo-alternators, the eventual provision of three turbo-alternators being all the additional plant which is likely to be required for many years to come. Continuing, the Committee states that at the present time it is only proposed to take out one Musgrave set. Subject to adoption of this proposal the estimated cost of installing the new plant works out as follows:—Main turbo-alternator complete with condenser and air filter, £7,500; motors for water and steam, &c., £300; pipe, water and steam connections, £300; instruments, gauges and sundries, £100; foundations, alterations and additions, £350. The Committee recommends the approval of an expenditure of £8,550 for carrying out the above scheme, and that the borough engineer be instructed to take the necessary steps to complete the proposed extension accordingly. In order that power consumers, who have a high load factor, may be able to secure the benefit of a cheaper rate, the Committee has decided to make a charge of £4 10s. per KW. of maximum demand, plus ½d. per unit for all units registered by the consumer's meter, as an alternative to the present charge for energy of 1d. per unit, which is considered as unsatisfactory to large manufacturers who are able to generate their own electricity at a cheap rate.

Newcastle-on-Tyne.—TARIFF DISCUSSION.—At a meeting of the Electrical Section of the Newcastle and Gateshead Chamber of Commerce on the 9th inst., the question of a uniform tariff for lighting, heating and power purposes was discussed. In addition to the members of the Section, there were also present several of the distributors of electric power in the counties of Northumberland and Durham. What it is sought to attain is a means of agreement upon principle for a uniform tariff. Information from the various distributors in the two counties was placed before the meeting, and it was arranged that this should be sent to each member for consideration, and subsequently another meeting will be held.

Newport (Mon.).—The working of the Electricity and Tramways undertakings during the year ended March 31st last has resulted in losses of about £1,093 and £2,327 respectively.

TURBO-ALTERNATOR FIRE.—Recently a 1,500-KW. turbo-alternator at the Corporation power station was burnt out, and Mr. C. P. Sparks has since reported on the matter. Having regard to this report, the Council has decided:—(1) To invite alternative tenders for (*a*) reconstructing the present alternator, (*b*) a new alternator; (2) that the alternator should be fitted with an air filter; (3) that the alternator should be cleaned and inspected quarterly, a written report being made as to the condition of the plant; if the inspection is not satisfactory, the period of inspection should be shortened; the engineer to make personal inspection if anything of a special nature is reported; (4) that the three-phase 6,000-volt system should be worked in future, with the neutral earthed through resistance; (5) that as an additional turbo-alternator is on order, the switchgear should be modified, the generators being protected on the balanced-protective system.

Paraguay.—The electric street lighting of Asuncion is to be increased by the addition of 300 arc lamps.

Queen's Ferry.—A motion was introduced at the meeting of the Hawarden (Cheshire) District Council by Mr. R. G. Roberts that the subject of the electric lighting of Queen's Ferry be postponed indefinitely. He said that the time was not ripe for the scheme to be taken up by the Council. Mr. Millington said it was not wise to delay. They should hasten on and get a provisional order through this Session. The motion was lost.

Rochdale.—ANNUAL ACCOUNTS.—The published returns of the electricity department for the year ended March last show a total revenue of £27,066; working expenditure amounting to £15,326, and a gross balance of £11,740. In disposing of this balance, the sum of £9,028 represents interest, loan charges, income-tax, depreciation (£1,233), &c, leaving a surplus of £2,883 to be added to the appropriation account, bringing the latter up to £5,493. The rates received £2,500, and the reserve fund £110; and the department now has £7,283 placed to reserve, £4,337 in the depreciation fund, and £2,883 unappropriated. Nearly 5½ million units were generated, and 4,823,000 sold, including 575,000 for lighting, 1,813,758½ (!) for power, 2,413,294 for traction, and over 20 000 units to the Littleborough area. An all-round average of 1·3d. per unit was obtained. The department is on the eve of great extensions which will increase its plant capacity from 2,476 to 5,476 KW. None of this new plant has been brought into use, but applications have been received for half its capacity. For the first time, the general supply for lighting and power is slightly in excess of that supplied for traction.

Rochester.—STREET LIGHTING.—The T.C. has sanctioned lighting experiments in the High Street by the Kent Electric Power Co. The installation will be given a six weeks' trial to enable the Works Committee of the Council to form an opinion as to the efficiency of the proposed system and to form a basis of an estimate for the cost of the whole scheme.

Ramsbottom.—The Lighting Committee of the Corporation has had an interview with Mr. Taite, manager of the Lancashire Electric Power Co., upon the lighting of street lamps by electricity at Summerseat, and the lighting of the railless traction route. Consideration of the matters has been deferred, pending the receipt of a further report from Mr. Taite.

Rye (Sussex).—Messrs. Foote & Milnes, Ltd., have informed the T.C. that they intend applying for a prov. order for E.L.

St. Annes-on-Sea.—L.G.B. INQUIRY.—An inquiry has been held by Mr. T. C. Ekin, on behalf of the L.G.B., into the application of the U.D.C. for sanction to borrow, among other amounts, £3,000 in connection with the electricity undertaking. It was stated that last year the profits were £2,298; a sum of £5,365 had been set aside for depreciation and £5,529 had been handed to the relief of the rates.

Stalybridge.—L.G.B. INQUIRY.—Application by the Joint Board for sanction to borrow £22,550 for additional plant at the generating station of the Joint Board, formed the subject of a L.G.B. inquiry on July 9th. Mr. Schofield (commercial manager) gave details of the proposed expenditure, and said the additional plant was needed to enable the Board to supply the customers with electricity. Mr. Blackmore (engineer-in-chief) said the maximum demand was 5,800 KW. in 1912, and 7,300 KW. in 1913. For the first three months in 1913 the number of units sold was 5,225,729, as against 3,605,000 in the corresponding period of 1912, being an increase of nearly 40 per cent. The maximum load had gone up 500 KW. on a summer's consumption, which meant 1,200 KW. on a winter's consumption. They had reached the capacity of their generating plant with the present application. There was some opposition on behalf of the Hyde Property Owners' Association, but the Inspector (Mr. T. C. Ekin) said, on the evidence, he thought additional plant was required. It was then intimated that if the Inspector thought it was a necessity to have the money, the opposition of the Association would be withdrawn. The inquiry was closed, and the Inspector subsequently visited the works.

Swanage.—Mr. A. P. Trotter, on behalf of the B. of T., held an inquiry on July 8th relative to the proposal of the Swanage Electricity Supply Co., Ltd., to construct a generating station on a site at Court Hill. Opposition was offered by residents on the Court Park Estate. Dr. Purves, consulting engineer to the company, said there was no foundation for the suggestion that the plant would be a nuisance or annoyance to anyone. The inspector pointed out that with a well-constructed station it was hardly possible standing in the road to know whether the machinery was running or not.

Swansea.—The B. of G. has decided to have the electric light and fans installed at the Union Offices.

Taunton.—ANNUAL ACCOUNTS.—The electricity undertaking for the year ended March 31st, shows a gross profit of £5,044, which, with other amounts included, makes altogether £5,642, which has been disposed of as follows:—Interest, £1,431; redemption of loans, £2,739; transferred to renewals, £212; transferred to capital account, £190; transferred to free wiring purchase account, £1,067. The sum of £1,067 paid out of revenue to the National Electric Construction Co. in settlement of all claims in respect of free wired installations has made it necessary to withdraw the sum of £510 from the reserve account.

Thornton (near Fleetwood).—The U.D.C. has received notice from the Bispham U.D.C. of the latter's intention to apply for a prov. order to supply electric energy to the West Ward of Thornton.

Thornley.—The Weardale Coal Co. has agreed with the P.C. to provide and maintain metal-filament instead of carbon-filament lamps at the old price of £2 per annum for each lamp.

U.S.A.—The Treasury Department has ordered that carbon and metallised carbon-filament lamps should not be used in Government buildings, and these have been replaced by 25-watt tungsten lamps.

Wallasey.—L.G.B. INQUIRY.—An inquiry has been held into an application by the T.C. for borrowing powers to the extent of £28,289, including a sum of £13,500 for purposes of the Corporation electricity undertaking. The Town Clerk explained that of the £13,500, £3,659 had been spent in anticipation of the sanction, and the remainder was in respect of prospective expenditure during the next four years. The inspector pointed out that the Board would not give sanction for more that three years, so that the Council would have to be satisfied with £7,381. This would make the total amount in respect of that application £11,040. The Town Clerk, in his statement, said an application was to be made to the Board for power to borrow the sum of £65,000 for the establishment of a new electricity station on another site than the present station.

Waterford.— ELECTRICITY SUPPLY SCHEME.— The Lighting Committee of the Corporation has decided to take steps to promote a municipal electric lighting scheme. Arrangements are to be made for procuring the prov. order, and the services of an expert are to be obtained.

Watford.—The U.D.C. has sealed an agreement with the Northwood E L. and Power Co., Ltd., for a bulk supply of current to Northwood.

Whitstable.—Mr. G. Stainton has informed the U.D.C. that he intends to apply for a prov. order for electric lighting.

Westgate-on-Sea.—Owing to concessions made by the Westgate Gas Co., the Isle of Thanet R D.C. has withdrawn its opposition to the company's application for electric light powers for Westgate and Birchington.

Walsall.—It has been decided by the T.C. that the price of current supplied to the Corporation tramways be as from January 1st, 1913, 1 68d. per unit, which would represent an increased annual payment by the Tramways Committee of over £1,500. The E.L. Committee reports that it cannot comply with a memorial from the Tradesmen's Association to alter the price of electricity for lighting purposes at present. The Committee declines to entertain a suggestion made to negotiate for the sale of the undertaking to the Shropshire, Worcestershire and Staffordshire Electric Power Co.

Winchester.—L.G.B. INQUIRY.—On Monday a L.G.B. inquiry was held into the application of the T.C. for a loan of £1,800 for extensions to the generating station. There was no opposition.

Warminster.—The U.D.C. has received notification of the intention of Mr. J. H. Edwards, of Bristol, to apply for a prov. order for electric light.

TRAMWAY and RAILWAY NOTES.

Argentina.—La Sociedad Empreza de Luz y Fuerza Buenos Ayres y Mendoza has recently considerably extended the plant at its hydro-electric generating station. It has also recently completed and put in operation 10 miles of electric tramways in the town of Mendoza.

Bournemouth.—In connection with the scheme for the reconstruction of the tramways from the cemetery to Winton and King's Road, the T.C. has decided to apply to the B. of T. for sanction to substitute double lines in place of the existing single line and loops, and also for permission to obtain a loan for the difference in cost between relaying the original line and the proposed double line. The general manager has been instructed to prepare the specification and obtain tenders for the work.

Bradford.—Though no official intimation was made, it is generally understood that, at its meeting last week, the Tramways Committee decided to grant the application which has been made by the Amalgamated Society of Tramway and Vehicle Workers for advances in wages of Bradford tramway employés. These advances are not to interfere with the general revision, which is due early in the next municipal year.

Chile.—The *Diario Oficial* publishes a decree under which an electric tramway service is to be provided in the town of Talca, in conformity with the plans and specifications as approved. Work must be completed before May 23rd, 1914.—*Board of Trade Journal.*

Ealing.—L.U.T. LEASE.—The B.C., at its meeting last week, again considered the proposal to extend the London United Electric Tramway Co.'s lease for a further period of 14 years. A deputation of ratepayers was received, which urged that the company's proposals were to be viewed with grave suspicion. If extension of the lease was inevitable, the deputation submitted that one of the conditions of the lease should be the provision of halfpenny fares. After the deputation had retired, a number of recommendations were submitted by the Tramways Special Committee, the most important being that halfpenny fares should not be sought for; that the annual amount to be paid by the company for the right of way be increased to £750 during the first seven years of the extended lease and to £1,000 from the expiration of the seventh year until the purchase of the undertaking by the local authority; and that the whole of the tramway rails and wood paving, for which the company is now responsible, be relaid by the company. It was stated that the question of removing all or some of the centre standards had been adjourned, and in the circumstances, further consideration of the above matters was deferred until such time as the Committee is ready with a final report.

Edinburgh.—Several proposals for tramway extension were before the Tramway Committee last week. The Committee was asked to consider the advisability of promoting a provisional order at the earliest opportunity for the extension of the tramways to Redford. Another proposal was to consider and report as to the expediency of making extensions beyond the city boundaries, and it was also proposed to seek powers for an extension to Corstorphine. The proposals were sent to a sub-Committee for consideration.

The Committee also discussed matters relating to the Colinton tramways and a sub-Committee was appointed to consider what steps should be taken.

Ilford.—The Seven Kings Ward Association has written the Council, enclosing a copy of a resolution passed by the Association, which expresses the opinion that if a universal halfpenny fare were introduced throughout the Ilford tramway system, it would be the best remedy for motor-omnibus competition. The matter is under consideration. Tenders are being invited for different types of motor tower wagons.

London.—CAMBERWELL.—The L.C.C. has lodged an objection against the assessment of its tramways, which the B C. had included in the provisional list at a reduction of £1. The B.C. considers the case presented by the County Council as very serious, and a revaluation of the lines is to be made.

Mexboro' and Swinton (Yorks.).—The Sheffield and South Yorkshire Navigation Co. and the West Riding County Council have lodged petitions against the Mexbro' and Swinton Tramways (Railless) Bill The Highways Committee of the County Council has expressed the opinion that the clauses relative to widenings and maintenance of main roads are highly objectionable from the Council's point of view, it being an unwarrantable innovation to require the road authority to bear the greater part of the cost of widening and adapting roads to the peculiar needs of such a commercial undertaking.

Morecambe.—Unable to, as yet, persuade the Corporation of the advantages to be gained by changing its ancient horse tramway system into an electrified one, the section of the community which is maintaining an unceasing agitation in the hope of lifting the town out of its antiquity in this respect, has now turned its attention to the Tilling-Stevens petrol-electric tramcar as a solution of the question. It is pointed out that this type of car is on trial by the L.C.C. and is easily adaptable to existing horse cars.

Oxford.—THE TRAMWAY QUESTION.—The T.C. on July 9th adopted the system of tramways and 'buses proposed for the city, as outlined in a recent issue of the ELECTRICAL REVIEW, and which will be carried out by the National Electric Construction Co., Ltd.

Ramsbottom.—In the matter of the installation of railless trolley cars, there has been considerable delay, but the Council has now secured a promise that at any rate two cars will be delivered before the end of August.

Reading.—The T.C. has referred to the whole of the members of the Corporation, as a Committee, a scheme for the provision of railless cars for the borough at an estimated cost of £23,839.

Rotherham.—The R.D.C. has appointed a deputation to confer with the Rotherham Corporation as to the running of motor-omnibuses to Dinnington.

Teddington.—As it is considered that the existing through service and through fares should not be upset, the District Council is, at the instigation of the Middlesex District Councils' Association, supporting the action of the House of Commons Committee in inserting a clause giving running powers to the L.U.T. Co. over the lines which the L.C.C. is about to acquire in the Hammersmith and Shepherd's Bush area.

TELEGRAPH and TELEPHONE NOTES.

Brazil.—Last year a wireless station was established on the Island of St. Caterina, in the State of that name in Brazil, near the city of Florianopolis, by the Berlin firm of C. Lorentz Aktiengesellschaft, for the Government, and was equipped on the alternating-current "Vielton" system. It was intended to provide communication with the shipping to Buenos Ayres, La Plata and Cape Horn, and with neighbouring land stations. The power in the antenna is 2 KW., the sender having waves of 1,400, 1,700 and 2,800 metres length. Ranges of between 600 and 700 miles have been attained, reciprocal communication having been established with the São Thomé station at Rio de Janeiro. The station differs essentially from other wireless stations in the use of the Vielton system. While other stations can only make use of one tone, and only in exceptional cases resort to a more complicated arrangement to secure two or three tones, the St. Caterina station, by a special disposition of the "Vielton" system, can make use of eight different tones in close succession. The apparatus which effects the tone variation is like a piano keyboard, the tones being produced by the pressure of the different keys. The command of a

number of tones is of great importance in South America, owing to the frequent atmospheric disturbances there prevalent, as the choice of a suitable tone, or the avoidance of the change of a tone during the transmitting of a message, can be more easily effected than with the ordinary stations having command only of a single tone. The plant consists of two 18-H.P. oil motors and two A.C. generators, one set being held in reserve. At a distance of about 100 metres are erected two wooden masts, over 50 metres high, which, with ten smaller masts, carry the net-like antennæ.—*Telegraphen und Fernsprech-Technik.*

Barnsley.—The Corporation Electricity Committee has given its engineer, Mr. Barker, permission to fix, at his own cost, a wireless telegraph antenna to the chimney stack at the electricity works.

Cable Cession.—The Black Sea Telegraph Co. has transferred its cable between Constantinople and Odessa to the Eastern and Indo-European Telegraph Companies, which will work it in common.—*Journal Télégraphique.*

Colonial Wireless Stations.—On Wednesday last week Mr. Harcourt stated that a low-power 5-KW. wireless station was being erected in the Bahamas, and contracts were being entered into for the erection of similar stations at Barbados, Mombasa, Singapore, Penang and Hong-Kong.

German Colonies.—It is expected that a wireless connection between Germany and her Colonies will be established in the near future. According to an arrangement made with the Imperial Colonial Office, the Telefunken Co. has dispatched an expedition to Togoland, which is already in the interior of the Colony and which is making experiments to communicate by wireless with the Nauen station, near Berlin. The trials have been so far successful that long messages have been received in Nauen from the expedition, whilst efforts to transmit telegrams to the expedition are being continued. Experiments are also being made to place Togoland in wireless communication with German South-West Africa and the Cameroons. As it is desired to bring these schemes to a successful issue as soon as possible, the trials made early this year between Nauen and Sayville, Long Island, U.S.A., have been temporarily suspended, although they will be resumed on the completion of the connections with the before-mentioned Colonies. In the case of Samoa, the Telefunken Co. has acquired a site at Tajaigata, which is not far distant from the Samoan capital of Apia, for the erection of a station which is to have a range of 1,860 miles, and the work is to be commenced immediately. At the same time, stations are to be established at Rabaul, the capital of German New Guinea, and on the German island of Nauru, and all these stations will be placed in intercommunication.

Stonehaven.—It is stated that negotiations are proceeding for the erection of a wireless telegraph station near Stonehaven.

Trans-Atlantic Wireless Telegraphy.—Mr. Marconi, whilst in the United States last month, stated that all the European business intended for the United States would come through the Belmar, N.J., station when the plant was completed. The distance from the Belmar station to that at Carnarvon, Wales, is 3,000 miles. The Glace Bay, N.S., station would be reserved for Canadian and Pacific wireless business. A speed of 60 words per minute would be attained between Carnarvon and Belmar.—*T. and T. Age.*

The Telephone System.—On Thursday last week, the Postmaster-General stated in the House of Commons that the total cost of the Post Office telephone exchange system, including private lines and land and buildings, on December 31st, 1912, was £7,992,078. The purchase price of the National Telephone Co.'s system was £12,470,264, that sum representing its depreciated value; the original capital expenditure might be placed at about £16,000,000.

The Imperial Wireless System.—Answering questions in the House of Commons last week, Mr. Samuel said that the Imperial system could not be thrown open to public tender because financial guarantees were useless; certainty was essential, and the only system that could be said with certainty to be capable of fulfilling the requirements of the Imperial chain, as stated by the Scientific Advisory Committee, was the Marconi system, which alone had demonstrated its capabilities under actual test. He had asked the representatives of the Goldschmidt system to arrange for an official demonstration, but so far his request had not been acceded to. His expert advisers had not recommended a change of plans on account of the reported success of the Goldschmidt system.

In reply to further questions, Mr. Samuel stated that if proof were forthcoming in the course of the next few months that the Goldschmidt system could fulfil the required conditions, he would be pleased to consider its employment for the second three Imperial stations. Nothing could be done before the rising of Parliament. The Canadian agreement with the Poulsen Co. was of a wholly different character to the Imperial contract; the stations would be the property of the company, and would be worked by the latter at its own risk and for its own profit. No firm but the Marconi Co. possessed the necessary staff and equipment to carry out the scheme, without very considerable delay.

On Thursday the refusal of the P.M.G. to consider other tenders was debated in the House of Commons at considerable length.

Writing to the *Times*, Prof. J. Milne enters a strong protest against the granting of a monopoly to any firm, in view of the rapid development of wireless telegraphy, and the probability of fundamental changes in the near future. A "Member of Parliament," in reply, points out that nothing in the nature of a monopoly is to be conferred on the Marconi Co.; the stations, when built, become the property of the Government, which can adopt any system it pleases, and will not have to pay royalty unless the unexpired Marconi patents are used in them. It would be useless to await finality, and the provision of wireless communication is an urgent necessity on strategic grounds.

Wireless Litigation.—The case of the Marconi Co. against the National Electric Signalling Co., of Pittsburg, Pa., on Marconi patent reissue No. 11,913, the patent of Sir Oliver Lodge, No. 11,914, being also included, is being heard before Judge Veeder in the United States Court in Brooklyn. The case was delayed, awaiting the arrival of Mr. Marconi, who was detained by the Parliamentary inquiry into the matter of the distribution of Marconi stock to officials in Great Britain. The point involved is the tuning of various elementary parts of the wireless circuit at both the transmitting and receiving stations so as to secure the maximum effect from any given series of impulses. It is understood that immediately following this effort, other patents owned and controlled by the Marconi Co. will be put at issue.—*T. and T. Age.*

CONTRACTS OPEN and CLOSED.

OPEN.

Alford (Lincs).—July 28th. Public lighting for the U.D.C. Mr. Thos. N. Loy, clerk.

Australia.—VICTORIA.—August 4th. (*a*) Twin surface condensers, hotwells, piping and sundries; (*b*) air and water extraction pumps and motors; (*c*) circulating water and sump pumps, with motors, for the Melbourne Suburban Railways power house. See "Official Notices" June 13th.

August 19th. 105 miles paper-insulated, lead-covered cable. See "Official Notices" to-day.

September 9th.—Common-battery multiple switchboard. See "Official Notices" to-day.

September 16th.—Switchboard, C.B. or automatic or semi-automatic, at Collingwood. See "Official Notices" to-day.

QUEENSLAND.—August 27th. Five sections of common-battery multiple switchboard, for the P.M.G.'s Department. See "Official Notices" to-day.

September 10th.—Nine sections of trunk line switchboard, for the P.M.G. See "Official Notices" to-day.

WESTERN AUSTRALIA.—July 19th. Switchgear and accessories for an electric power station at Perth. See "Official Notices," June 27th.

SOUTH AUSTRALIA.—August 13th.—Common-battery switchboards and telephone parts for Adelaide. See "Official Notices," July 4th.

NEW SOUTH WALES.—August 20th. Pneumatic ash-handling plant for the White Bay power house. Specification No. 415 (5s.) from Electrical Engineer's Office, 61, Hunter Street, Sydney.

August 27th. Telephones, switchboards and incandescent lamps, for the P.M.G. See "Official Notices" to-day.

ADELAIDE.—August 19th. Steel poles for the Municipal Tramway Trust. No date.—Copper cable and wire.

Belfast.—July 21st. One 3,500-ampere traction switchboard panel, for the Corporation. See "Official Notices" July 4th.

Blackburn.—August 2nd. Steam coal for the Electricity Committee, for 12 months ending August 31st, 1914. Mr. P. P. Wheelwright, engineer and manager.

Blackhill (Co. Durham).—July 19th. Electric light equipment, Richard Murray Hospital (dynamo, battery, switchboard, and about 200 lights); Mr. Ernest Caldwell, secretary of the hospital (returnable deposit of £1).

Bosnia.—The municipal authorities of Doboj, North Bosnia, have just invited tenders for the establishment of a central electric lighting station in the town.

Bristol.—July 24th. Unwashed small coal for six or 12 months for the Corporation electricity works, Avonbank. Mr. H. F. Proctor, engineer and general manager (returnable deposit of £2 2s.).

Chile.—September 13th. (1) An electric generating plant with distributing system; (2) an electric lighting installation—both for the harbour of Valparaiso. Tenders to "Al Sr. Secretario de la Comision, Comision de Puertos, Calle Santo Domingo No. 1,147," Santiago de Chile, where the specifications, &c., may be consulted.

Eccles.—July 21st. Mechanical stokers for four Lancashire boilers at the electricity works, Cawdor Street, Patricroft. Borough Electrical Engineer.

Germany.—July 30th. The Prussian State Railway authorities at Munster, Westphalia, are inviting tenders for four 5-ton electrically-operated travelling cranes.

Hull.—July 25th. Machinery oils for the Corporation electricity works. Mr. H. Bell, electrical engineer, Sculcoates Lane.

Italy.—July 24th. The municipal authorities of Alcaneo (Trapani) are inviting tenders for the concession for the public and private electric lighting of the town during a period of 15 years.

London.—Hackney.—July 24th. Extra-H.T. ring main conduits, sub-station plant, switchgear and cranes, for the B.C. electricity department. See "Official Notices" June 20th.

H.M. Office of Works.—July 18th. Supply of electric cable and wire during one year from September 1st, 1913. See "Official Notices" July 4th.

L.C.C.—July 22nd. Switchgear for tramway sub-stations. See "Official Notices" July 11th.

July 23rd. Electrical installation (235 points) at Tollit Street School, Mile End, E. See "Official Notices" July 11th.

Rotherhithe.—July 31st. Electric light re-wiring and other work at the Infirmary, Lower Road, Rotherhithe, S.E., to the specification of Mr. A. H. Newman, F.R.I.B.A. Forms of tender, &c. (£5 note deposit) from Town Clerk, 283, Tooley Street, London, S.E.

Middleton.—July 28th. Lighting switchboard and renewals to traction switchboard for the Corporation. See "Official Notices" to-day.

Newport (Mon.).—July 19th. Extra-high-tension switchgear, for the Corporation. See "Official Notices" July 4th.

Re-winding 1,500-kw. three-phase alternator. Mr. A. N. Moore, electrical engineer, Town Hall.

New Zealand.—September 6th. Christchurch City Council. Thirteen-panel E.H.T. switchboard and accessories, for use in connection with the distribution in Christchurch of energy from the Lake Coleridge hydro-electric station. Specification (10s.) from City Electrical Engineer, 153, Gloucester Street, Christchurch. Deposit £50. Can be seen at B. of T. Com. Int. Dept., London.

Norwich.—August 12th. One 3,000-kw. turbo-alternator and surface condensing plant; rotary converters; E.H.T. switchgear for the Electricity Committee. See "Official Notices" to-day.

Sherburn (Co. Durham).—Extension of electric lighting system along Park Road and Littletown Road for the P.C. Clerk to the Council, 112, Anderson's Terrace, Leamside, Fence Houses.

Shipley.—July 22nd. Two 1,000-kw. steam turbines, two 1,000-kw. alternators, two surface condensers, and one controlling switchboard, for the U.D.C. See "Official Notices" July 11th.

South Africa.—September 10th. Public Works Department. Three electric bed lifts for the new hospital at Port Elizabeth. Particulars can be seen at Board of Trade Com. Int. Dept. in London, or obtained from District Engineers of Public Works Dept. at various places in South Africa.

Bloemfontein.—August 21st. Tenders are called for supply and equipment of electric tramways (railless) within the city. Plans and specifications on payment of £5 at the offices of Messrs. Davis & Soper, 54, St. Mary Axe, London, E.C., on and after July 19th. Tenders to the Town Clerk, Town Hall, Bloemfontein (or by noon, August 1st, to Messrs. Davis & Soper).

Swindon.—July 26th. Steam coal for the electricity works of the Corporation. See "Official Notices" July 11th.

Todmorden.—July 26th. 300-kw. converting plant, H.T. switchboard and cables, mechanical stokers and superheaters, for the B.C. See "Official Notices" July 11th.

Warrington.—August 6th. (1) E.H.T. feeder panel; (2) earthenware conduit for one year, for the Electricity Department. See "Official Notices" to-day.

CLOSED.

Bettws-y-Coed.—The tender of Mr. Osborne Yale (£60) for installing electric light at Bryn Mawr Chapel has been accepted.

Cheltenham.—The T.C. has accepted the tender of Messrs. Wm. Cory & Son, Ltd., for Cannop coal for the electricity works, at 12s. 11d. per ton.

Croydon.—The T.C. has accepted the tender of Le Grand & Sutcliffe, of London, for a deep-well pump for the electricity works, at £435.

Elland.—The U.D.C. received tenders from the following firms for the supply of 20 street-lighting lanterns:—

Hinchliffe Green Manufacturing Co.
British Thomson-Houston Co. (Accepted.)
Wardle Engineering Co.
British Westinghouse Co.
Harry Moss.
Drake & Gorham.
The Electrical Co.
Reason Manufacturing Co.
Veritys, Ltd.
General Electric Co.
Electrical Engineering and Equipment Co.
British Economical Lamp Co.

Heston and Isleworth.—The following tenders have been received by the Education Committee for installing electric light at the Hounslow Heath Schools:—

		£	s.	d.
S. N. Virgo	(accepted)	72	0	0
Harris & Gubbins		81	5	0
H. Beard & Co.		82	3	6
R. Langston, Jones & Co.		84	0	0
J. McDonald		85	0	0
Grant & Taylor		118	7	6

Harwich.—The T.C. has accepted the tender of Messrs. Stuart & Moore, of Ealing, W., for the installation of electric fire alarms, at £231.

Lamp Contracts.—The Brimsdown Lamp Works, Ltd., have received the Brighton Corporation and Bridlington Corporation's annual contracts for supplying "Brimsdown-Wirum" metallic-filament lamps for street lighting, &c. Other annual contracts received during the past few weeks are for the Great Eastern Railway, Midland Railway, Colchester Corporation, Tunbridge Wells Corporation, and Bray U.D.C.

Leyton.—Mr. J. T. Halsey having intimated to the Urban Council that, in his tender of £376 for the electric lighting of Church Road School, he omitted to make allowances for contingencies or profit, and that the correct figure should have been 10 per cent. higher, or £414, the Council has accepted the next higher tender, namely, that of Messrs. Ryan & Son, of Leytonstone, at £425.

London.—Bermondsey.—The tender of the British Insulated and Helsby Cables, Ltd., has been accepted by the B.C. for supplying two eight-way feeder pillars, at £45 6s. each; one 10-way feeder pillar, at £52 1s.; and one 12-way feeder pillar, at £57 13s.

Hornsey.—Messrs. Herbert Clarke, Ltd., have successfully tendered to the B.C. for the supply of 1,000 tons of wharf slack coal to the electricity department, at 13s. 5d. per ton; and Messrs. Charrington, Sells, Dale & Co. for 1,000 tons of large steam coal, at 15s. 10d. per ton.

Malay States.—Messrs. Hick-Diesel Oil Engines, Ltd., have received an order for one 320-B.H.P. Hick-Diesel oil engine for driving a generator at the Lahat Mines, Ipoh.

Newport (Mon.).—The tender of the General Electric Co., Ltd., has been accepted by the T.C. for rewinding the turbo-alternator. The tenders of Bertram Thomas have also been accepted, at £213 and £56, for extra high-tension and low-tension switchgear, with British Thomson-Houston switches; as well as the tender of Walter Scott, Ltd., for 100 tons of tramway rails, at £7 15s. per ton.

Ramsbottom.—The Traction Committee has recommended the Council to accept the tender of the Lancashire Electric Power Co. for a switchboard at the depôt in Stubbins Lane.

Rhyl.—The Council has accepted the tender of Messrs. Foote & Milne for a new overhead cable for lighting the marine lake pleasure grounds.

Southampton.—The T.C. received the following tenders for wiring the School Clinic:—

		£	s.	d.
A. T. Wells & Co.	(accepted)	29	9	0
W. Dibben & Sons		29	10	0
A. Kingman & Co.		36	0	0
I. Groves & Co.		45	0	0
F. W. Cook & Co.		49	17	6
H. M. Ashton, Ltd.		69	0	0

Swansea.—The T.C. has accepted the tender of Messrs. Furneaux & Thomas, at £775, for electrically lighting the Training College. Other tenders were received from Collings Bishop, Ltd.; Thomas & Evans; Ellis & Ward; A. Paxton & Co.; Blackburn, Starling & Co.; H. J. Cash & Co.; Troup, Curtis & Co.; W. C. Tackley & Co.; Saville & Walton; Oliver Bros.; R. Alger and Sons.

Walsall.—The Corporation Electricity Committee has accepted the following tenders:—

Harris Patent Feed-Water Filter (1910), Ltd.—A water softener, for £345.
Norman, Ltd.—New steel and iron building for the additional boiler house, for £3,974.

Watford.—The U.D.C. has sealed the following contracts:—

Union Electric Co.—Motor-generator.
W. T. Henley's Co., Ltd.—Cables.
Electric Construction Co.—Switchgear.

West Bromwich.—The Electricity Committee of the T.C. has accepted the tender of the Vulcan Soot Cleaner Co., Ltd., for a patent boiler cleaner, at £81.

West Ham.—The T.C. has accepted the tender of Messrs. J. Baker & Co. (Rotherham), Ltd., for a supply of 32-in. steel tires to the tramways department.

Winchester.—The T.C. has accepted the tender of Mr. R. G. Gifford for about 1,000 tons of Norton Hill slack coal for the electricity works; and that of Bradbury, Son & Co., Ltd., for about 750 tons of Camerton slack coal.

Wolverhampton.—The Corporation Electricity Committee has accepted the tender of Messrs. Hayward & Sons, at £87, for the necessary steelwork for an ash hopper.

Willesden.—The U.D.C. has accepted the tender of Mr. J. McManus for the erection of a sub-station in Acton Lane, Harlesden, at £2,037. From eleven tenders for a motor lorry for the Electricity Department, the lowest, that of the Hillman Motor Car Co., Ltd has been accepted

FORTHCOMING EVENTS.

Commercial Vehicles Exhibition.—Friday, July 18th. At 11.30 a.m. At Olympia. Opening by Prince Arthur of Connaught.
Imperial Motor Transport Conference.—Friday, July 18th to 25th. At Olympia, London.

NOTES.

National Telephone Co.: Distribution of Assets.—Since the closing of our legal proceedings on page 95, the Court has given its decision in this case, under which the whole of the remaining assets, amounting to approximately £1,131,250 will be divisible among the deferred stockholders only. Mr. G. Franklin, the liquidator, announces that, pending the result of a possible appeal, he has been authorised to make an early distribution to the deferred stockholders of approximately £820,000. This will mean a payment to them of 4s. 4d. in the £. They have already received payment at the rate of 15s. in the £.

Half-Watt Lamps.—It appears that the half-watt per candle lamps, referred to in our last issue as about to be placed on the German market, do not concern the ordinary classes of lamps of from 10 to 100 C.P. The lamps in question are of high candle-power, about 1,000 C.P. and over, and are therefore intended as competitors of arc lamps.

Appointments Vacant.—Charge engineer for the Erith U.D.C. electricity department (40s.); assistant electrical engineer for the Great Indian Peninsula Railway Co. for the power houses at their Parel and Matunga workshops, Bombay; switchman for Corporation Road power station, Newport, Mon. (25s.); electrician-Attendant for the County Asylum, Rainhill, nr. Liverpool (£50+). See our "Official Notices" to-day.

I.M.E.A.—An adjourned meeting of the Association was held on Friday last at the I.E.E., at which the new articles of association, discussed on June 20th, were adopted. The principal object of the meeting, which was numerously attended, was to further consider and discuss the proposed model general conditions of contract, which matter was discussed *in camera* during the recent convention.

The president, Mr. Chattock, suggested that the proposed clauses should be discussed *seriatim*. Alderman Bruce, Sunderland, noticing that the Press were present—an invitation having been issued to them by the hon. secretary, Mr. Faraday Proctor—moved that the meeting be held *in camera*, as on the previous occasion.

Mr. Faraday Proctor explained why the Press should be allowed to be present, pointing out that the hon. solicitor's advice had been taken on the matter, and Mr. J. E. Edgcome, the late president, supported the proposal. Various speakers argued against this, including Messrs. Tapper (Stepney), Roles (Bradford), and Dykes (Messrs. Handcock & Dykes), and on a show of hands it was decided, despite the official invitation to the Press, that the meeting should be held in private.

Annual Outings and Sports.—The staff of the London United Electric Tramways held their annual sports at Griffin Park, Brentford, on Wednesday last week, under the presidency of Mr. W. M. Acworth, chairman of the company. The function, which was capitally organised, attracted over 2,000 spectators, who enjoyed over five hours' continuous sport, the finishes in many of the events being exceedingly close. Perhaps the greatest interest was displayed in the tug-of-war tests, which are a feature of the meeting. In the tug-of-war open to tramway teams of the United Kingdom, for the "Lady Clifton Robinson" Challenge Cup, London United (Hanwell) in the first round beat City of Hull Tramways by 2 pulls to 1; London United (Fulwell), matched against Bournemouth Tramways, beat the visitors by 2 to 0; and in the final, Hanwell outmatched Fulwell by 2-0. The same depôts competed with similar success for the "Clifton Robinson" Challenge Shield. Another interesting event was the 3 miles scratch race for the "Acworth" Challenge Cup, which was won by H. E. Palmer, L.G.O.C.; B. E. Tayett, District Railway A.A., being placed second, W. Hawkins, London Electric Railway A.A., 3rd, and G. H. Grice, London Electric Railway A.A., 4th.

Mrs. Devonshire, introduced by the chairman of the company (who expressed his regret at the absence of Mr. J. Devonshire, managing director), distributed the prizes, and was thanked by Mr. J. B. Mackinnon, chairman of the Committee, for her presence, and presented with a charming bouquet by Miss Purvis. Amongst others present were Messrs. R. Smith (vice-chairman), A. H. Pott and A. F. Andrews, who ably discharged the duties of hon. secretary. The fine band of the Metropolitan Electric Tramways played selections during the afternoon, and the proceedings wound up with dancing on the lawn.

The annual outing of the White Electrical Instrument Co. took place on Saturday last, and a most enjoyable day was spent at Burnham-on-Crouch. The weather proving propitious, a delightful country walk in the morning was followed by yachting in the afternoon. Dinner was served at the White Hart Hotel, and the customary speeches followed.

The annual staff picnic of the St. Helen's Cable and Rubber Co., Ltd., took place on the 12th inst., a party of over sixty joining in a motor char-à-banc ride from Warrington through Delamere Forest to Chester. Dinner was served at the Hop Pole Hotel, and a trip up the Dee in boats (with a motor launch for the lazier ones) followed. Tea was served in *al fresco* fashion on the banks, and after visiting Eccleston Ferry, and participating in impromptu donkey races, the party made the return by water and road. Mr. C. Ford was in charge of the arrangements, which were admirably carried out, and the picnic tea itself was superintended by Mr. S. H. Lee, whose fertile mind, we are informed, adapted itself to the problems of making bricks without straw that occasionally occur on picnics.

The Kelvin Window in Westminster Abbey.—The memorial window to Lord Kelvin, which, as already stated, has been subscribed for by British and American engineers, and of which we gave some particulars last week, was dedicated on Tuesday afternoon by the Dean of Westminster in the presence of a very large and representative gathering of engineers and scientists of eminence. These included presidents and others from all the well-known engineering institutions (Mr. Duddell representing the I.E.E.), as well as Sir J. Larmor, Sir W. Crookes, Sir J. A. Ewing, Dr. J. T. Bottomley, Sir Douglas Fox, Mr. Alex. Siemens, Sir Henry Mance, Prof. G. Carey Foster, Prof. S. P. Thompson, &c. Before proceeding with the dedicatory service an address was delivered by the Dean relating to some of the outstanding features of Kelvin's career and character.

Inquiries.—A correspondent wants particulars and prices of automatic and semi-automatic coil-winding machines for large and small wires, suitable for winding all kinds of field coils and solenoids. An electric type-metal melting apparatus is inquired for.

Bedford Strike Ended.—It is reported that the strike at the works of Messrs. W. H. Allen, Son & Co., at Bedford, came to an end on 14th inst., when about 1,000 men returned to work. It is stated that the A.S.E. advised the men to return without the three men who had been dismissed.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. A. O. BUCKINGHAM, A.M.I.E.E., recently representing Messrs. Siemens Bros. Dynamo Works, in London, left yesterday for the Argentine. Mr. Buckingham will represent Messrs. McCarter & Kerr-Bock, consulting engineers, on the important engineering works being carried out by the Hidro-Electrica de Tucuman.

In the annual report of the working of the Wolverhampton Corporation electric light undertaking the Committee express their high appreciation of the very valuable services rendered by MR. SHAWFIELD during the past 17 years. The present efficient state of the undertaking affords in itself the best evidence of his able and successful management. Mr. Shawfield carries with him the best wishes of the Committee in his new sphere of labour. The present engineer, MR. ALLEN, has made, adds the Committee, an excellent start, and they feel confident he will make a worthy successor of Mr. Shawfield.

The appointment of MR. W. A. JOYNSON, referred to in our last issue, is that of foreman fitter (not mechanical engineer) at the St. Helen's electricity works.

MR. L. E. COMLEY has resigned his post on the staff of the Devonport Corporation Electricity Works, in order to take up the post of publicity engineer to the Torquay Corporation electricity works.

MR. L. C. HOPKINS, assistant mains superintendent of the Swansea undertaking, is to be granted an honorarium of £5 for extra work performed by him in connection with the duties of mains superintendent prior to the appointment of Mr. J. B. Sparks to that position.

The Willesden U.D.C. has decided to advance the salary of the chief electrical engineer, MR. A. W. BLAKE, by £100, in increments of £50 now, and £50 on April 1st, 1914.

General.—A dinner and smoking concert was held on Friday, July 4th, at the Queen's Hotel, Cardiff, to bid farewell to MR. A. E. GRANT, late manager of the Cardiff office of the British Insulated and Helsby Cables, Ltd., who was leaving the district to take up the managership of the Canadian British Insulated Co., Ltd. The chair was taken by Mr. Morley New, deputy electrical engineer of Cardiff. In proposing the toast of "Our Guest," Mr. New commented upon the good spirit which prompted so many of Mr. Grant's competitors to be present, and of the able way in which he had handled the business of the district, making for himself many private as well as business friends. Mr. New then presented to Mr. Grant, on behalf of many friends, a leather suit case, a bowl case, and a gold bangle watch for Mrs. Grant. The toast was seconded by Mr. Dalley. Mr. Grant's late position in Cardiff is being filled by MR. F. WYNDHAM LEWIS, who has for some years acted as his assistant.

Hearty congratulations to the Lord Mayor of Liverpool upon the honour conferred upon him by the King on the occasion of His Majesty's visit to Liverpool last week. SIR J. S. HARMOOD BANNER, M.P., is a director of the British Insulated and Helsby Cables, Ltd., the Midland Electric Corporation for Power Distribution, Ltd., the Automatic Telephone Manufacturing Co., and a number of other electrical companies.

The *Mining Engineering Review*, Melbourne, says that MR. HAROLD W. SMITH has been appointed engineer in charge of electrical work under the Home Affairs Department.

MR. W. E. HART, who has just been elected town clerk of Sheffield, had been for the past six years solicitor to the National Telephone Co.

MR. STANLEY L. B. LINES, managing director of the Chamberlain and Hookham Meter Co., Ltd., Canada, is due to arrive in England this week on his annual visit to headquarters.

MR. A. M. SIMPSON is proceeding to Pelotas, Rio Grande do Sul, South America, as resident engineer on the electrical undertaking, on behalf of Messrs. Kincaid, Waller, Manville & Dawson, consulting engineers, of Westminster, having severed his connection with the Brush Co., with which firm he has been connected for the past seven years as their agent and engineer in India.

MR. E. GOOLDING, who has been for the last seven years in the electrical department of the L.C.C. Tramways, has rejoined the British Thomson-Houston Co. and is sailing on 24th inst. for the Argentine in connection with railway electrification work. Mr. E. Goolding was with the B.T.H. Co. during the N. E. Railway Co.'s electrification scheme, and previous to that he was in the Electrical Department of G. N. Railway Co. (1).

On the occasion of his marriage at Melbourne (Derbyshire) on July 8th to Miss Alice Gregory, Mr. MAURICE EDWARD FOX was presented with a silver entrée dish by his colleagues and the employés at the Edison Accumulator Works, London, and with a silver epergne by the firm of Thos. A. Edison, Ltd.

The *Evening Standard* understands that although the report of SIR ALEXANDER KING'S coming retirement is unauthorised, it is substantially correct, and that he will vacate his post of Secretary to the Post Office very soon. On inquiry at the Post Office our contemporary was informed that Sir Alexander's retirement had been pending for some time. Sir Alexander became Secretary to the Post Office in 1911, having previously served as assistant secretary from 1903 to 1905. The post carries with it a salary of £1,750.

SIR HENRY NORMAN has gone to Vienna on behalf of the Wireless Committee, of which he is chairman.

Obituary.—We regret to read in the *Times* "Deaths" columns that MR. WILLIAM FRANCIS MELHUISH, late Deputy Director-General of Telegraphs, India, passed away at Folkestone on July 5th at the age of 71 years.

MR. R. HIND.—The death occurred on Monday of ALD. RICHARD HIND, J.P., a leading resident of Stockton-on-Tees, and who had for many years been the principal of the firm of Hind & Son, electrical engineers, Little Brown Street. The deceased was in his 75th year. He was the eldest son of the late Mr. John Hind, founder of the business, in which he served his apprenticeship, and to which he succeeded on his father's retirement. He was a leading public man, having participated in local government work for 38 years.

CITY NOTES.

Edmundson's Electricity Corporation, Ltd.

THE annual meeting was held on Thursday last week at Salisbury House, London Wall, E.C.

MR. P. D. TUCKETT, who presided, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 26), said he hoped to be able to satisfy the shareholders that substantial progress had been made during the past year. Dealing with the profit and loss account—that of dividends and interest received and accrued was sub-divided under three heads. The first item, that of dividends and interest from investments in, and advances to, subsidiary and other companies, showed the comparatively large increase of £4,704, an increase which was all the more gratifying in view of the dislocation of business and the heavy expense directly and indirectly resulting from last year's coal strike. Their coal bill alone increased by over £8,000, compared to what it would have been had prices remained the same as in the previous year, and in a good many instances, and for some considerable time, this increase in price was accompanied by a deterioration in quality. In face of this heavy burden, he thought they would agree that the increased profit of £12,414, which enabled the subsidiary companies to make them an increased distribution of £4,704, was eminently satisfactory. The second and third sub-divisions, viz., dividends and interest from investments in British, Colonial and railway stocks, and from temporary loans, &c., showed a reduction of £1,216, owing to the realisation of the investments and the reduction of the loans in connection with the redemption of the prior lien debenture stock, the interest on that stock being more than correspondingly reduced from £2,870 to £775. The gross trading profit had decreased by £2,816, from £11,678 to £8,861, but inasmuch as this decrease was entirely attributable to the smaller capital expenditure of the subsidiary companies—the profits of the private lighting department having increased—and as, moreover, this trading profit was one which they at present regarded as only to a small extent available for distribution, it was not a feature which caused them any concern. The loss on working the local authority and other undertakings was reduced by £2,029, a decrease which was all the more satisfactory in that it followed on a decrease of £1,080 in the previous year. The past year's improved results were, however, only partly accounted for by the increased working profit of these undertakings. To the extent of £750 they were due to their acquisition of the Frome undertaking and the consequent change in the form of the accounts. Administration expenses were £1,145 up, owing principally to the increase in the directors' fees in accordance with the resolution passed in June last year, the increase in the other items being due to the Insurance Act payments and to the normal growth of the business. There was a reduction of £2,095 in the prior lien debenture stock interest consequent on the redemption of that stock, and in future the item would no longer appear. Interest on the first mortgage debenture stock was less by £86, the redemption provision being correspondingly increased. The premium and expenses on redemption of the prior lien debenture stock, £1,206, was an entirely special item, which might perhaps have been more appropriately charged direct to reserve, but as they were proposing to carry a larger amount to reserve, its allocation was a matter of no real moment. The net result of the year's business was that they showed a net balance of £18,900 compared with £16,114 a year ago, an increase of £2,785; or, disregarding the special item of £1,206, to which he had just referred, and the drop of £2,816 in the gross trading profit, which for the reasons he had mentioned was of no real importance, an increase of £6,807. Having regard to the difficulties with which they had had to contend and to the fact that the only direct benefit they now derived from the increased profits of the Urban Company was in the form of a comparatively small amount of additional interest on further advances made to them, he thought they might consider this result quite satisfactory. During the past year the additional interest derived from the Urban Company amounted to £1,357 out of a total increased profit of £6,616, the whole of which would have been reflected in their accounts prior to the expiry of the guarantee two years ago. Fortunately, active trade and a miserable summer enabled them more than to counteract the adverse influences with which they had to contend, but it was only by the most unremitting attention that these improved results had been attained. Of the balance of £18,900, the dividend on the cumulative preference shares absorbed £12,000, leaving £6,900 which they proposed to carry to reserve. They believed the company to be now fairly launched on a course of steadily increasing prosperity, but it still behoved them to proceed with the utmost caution if they were to avoid any untoward setbacks. What they all desired and aimed at was to restore to the non-cumulative preference shares their cumulative rights at the earliest possible moment, and the quickest and surest method of attaining that end was to proceed slowly and avoid any risk of straining their resources. In the balance-sheet, the share capital was now shown in its reorganised form, with the ordinary reduced and the preference split into cumulative and non-cumulative, whilst on the other side the assets had been written down by £366,838, the item of goodwill, which stood at £25,000 in the last balance-sheet, having been entirely eliminated, not because they considered the goodwill of the business to be valueless, but because they felt it was much better to get rid of an intangible item of this kind whilst they were dealing with the situation. Proceeding to explain the terms on which the corporation had acquired the Frome undertaking, he said that they were simply stepping into the shoes of the Frome Urban District Council and excluding the free wiring and other capital found by them, were acquiring for £47,000 what cost them £55,000. Other items which showed considerable variation from a year ago were work in progress and the liquid assets, temporary loan and cash. Owing to the completion of a very large contract during the year, the amount of work in progress had dropped nearly £11,000, whilst the liquid assets showed a shrinkage of, approximately, £30,000. A year ago they totalled to over £66,000, whereas this year they were little more than £27,000. He might tell them that it had been no easy matter to provide for the capital requirements of their various subsidiary companies, as they had done during the past five years to the extent of several hundred thousand pounds, and it was, therefore, with considerable reluctance that they felt bound to save them an extra interest charge of £2,360 per annum by redeeming the prior lien debenture stock last July. In regard to the subsidiary companies, speaking generally, the progress was good. With a 3 per cent. increase of £83,508 in capital expenditure, the profits had increased £12,414 or 9 per cent., a yield on the additional capital of 15 per cent., which would have been 23 per cent. but for the increase in the price of coal. For the two previous years the corresponding increases were for 1911 £8,721, a 7 per cent. increase, yielding 9 per cent. on the extra capital for the year, and for 1910 £6,330, a 5 per cent. increase, yielding 7 per cent. on the extra capital for the year. The improvement, therefore, had been steadily progressive. The connections had increased by the equivalent of no less than 161,782 33-watt lamps, as compared with 126,522 for 1911; 107,299 for 1910; and 88,935 for 1909. This represented an 11 per cent. increase for the year, and afforded the best possible evidence of the healthy condition of the business and of the activity with which it was being pushed. Every year an increasingly large proportion of the connections was for power, but except that they might be affected to a greater extent by periods of slack trade, there was nothing unsatisfactory in this feature. The output showed a correspondingly enlarged increase of over 6,500,000 units, the lighting units having increased 6 per cent. and the power units 50 per cent. The average price for lighting was 4·7d., and for power 1d. with a combined average of 2d., the extra units sold during the year having realised an average of 1·13d. per unit. The only other matter to which he need allude was the progress of the Lancashire Power Co. For the past year it realised a profit of £15,000, against a profit of about £11,000 for 1911, practically no profit for 1909 and a loss of over £4,000 for 1908, whilst for the current year its profits should fall not far short of £20,000, so that here also steady progress was being made with much more encouraging prospects than at one time appeared probable. Generally, their progress and prospects were satisfactory and encouraging, and though, as he had on previous occasions explained, their progress was bound to be somewhat slow owing to the character of the business, there was little to complain of in a

development which had converted a profit of £20,000 five years ago into the profit of nearly £45,000 shown this year.

MR. A. A. CAMPBELL SWINTON seconded the motion, and the report was adopted without discussion.

General Electric Co., Ltd.

THE annual meeting was held at the Cannon Street Hotel, E.C., on Thursday of last week, Mr. H. Hirst presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, page 70), said that they were once more in the fortunate position of having a report which showed satisfactory progress. The net trading profits and income from investments amounted to £145,261 as against £133,564, to which must be added the balance brought forward, namely, £32,050, as against £12,214, which gave a total of £177,311 as against £145,777, to be dealt with. The interest on preference shares would in future years amount to £24,000. This year the amount claimed by the preference shares was only £19,878 as the new issue of these shares last year had only been paid up gradually throughout the period under review. The expenses of the new issue were £10,275, and they proposed to write them off out of this year's results. They were glad that in spite of this they could put to reserve the sum of £30,000, and beside this, they proposed to create a new kind of reserve under the heading of "Staff Benevolence," for which they put aside conditionally this year £3,000. This was a new feature in the balance sheet. The company had been in existence approximately 26 years, although only since 1900 in its present form. It counted among its staff a goodly number of members who had been in its service various periods from 10 to 25 years. It was not given to every member of a big organisation to draw a salary which enabled him to make provision for old age. They proposed to study, within the next few years, whether something in the way of a contributory superannuation fund might not be started, and, if found possible, they wished to send it into existence with a sound start-off. Whether or not they might succeed in so ambitious a scheme he could not predict to-day, but, in any case, one thing was certain, each year that went by brought them nearer to the time when demands on them were certain to arise, and they thought it only proper to provide in some form or other a fund so that they should not be found unprepared, and not be influenced in their grants during possible periods of momentary depression. They proposed to pay 10 per cent. on the ordinary shares, as against 7½ per cent. last year. He thought that students of their balance-sheet during the last 10 years would admit that the ordinary shareholders had pursued a most unselfish policy in the past. They had been satisfied with 5 per cent. for a considerable period, and with 7½ per cent. for the last year. Their principle aim had been to make the company's position sound, rather than to claim big dividends for themselves. Now that loose plant, tools, patterns and sundry utensils were written down to £1, fixtures and installations also to £1, goodwill and patents to the same figure, freehold land and buildings to £193,755, fixed plant and machinery to £76,500 (and by a recent valuation the last two figures had been shown to be over £100,000 less than actual value), they felt they were justified in returning to the dividend which they used to enjoy before they started their big manufacturing enterprises. Stock-in-trade and sundry debtors had increased by £87,290 and £62,211 respectively, but he could assure them that these increases were quite in proportion to the greatly-increased sales the company had effected. A few words in explanation of their investments standing at £293,447 was desirable. It was likely that this figure would still increase during the next few years without any immediate proportionate return. This item might be divided under four headings: First, investments in sundry works. Certain of their manufacturing departments producing specialities had been turned, for purposes of policy, into separate companies in most cases, so that they could take as partners, experts in specific lines. He referred in particular to their telephone, conduit and lamp works. These were entirely under their control, and their investments under this heading amounted to approximately £100,000. The second item, trading companies abroad, consisted of the General Electric Companies of South Africa, Australia, India, China, Argentine, France, Spain and Belgium. Some of these had started contributing towards their dividend, others had very considerable establishment charges to their debit, and would only contribute towards revenue when those establishment charges had been wiped off out of profits. The money invested in those companies was about £160,000. Regarding their investments in electrical supply companies, most of these were managed by them, and included the following undertakings: Madeira, Uitenhage, Bogota, Frinton, Barbadoes and Macclesfield. A number of those undertakings were already paying satisfactory dividends, others were of such recent beginnings that for the next year or two they would play a larger part in the company's capital expenditure than in giving returns under income from investment. Each one of them, however, had been embarked on only after careful thought and deliberation, and they had reason to believe that, with modest capital expenditure, each would, in due course, become a profitable investment. Regarding the item, sundry investments, some £10,000 or £12,000 were small ventures found desirable in the course of trading, but whether they were already dividend-earning or not, they all contributed in a lesser or greater degree towards the increased trading profits. The year, as a whole, had not been without its difficulties. They had borne the first brunt of the National Insurance tax, amounting to £3,000 or £4,000; they had suffered greatly through the effects of last year's coal and railway strikes. A consequence of those unfortunate strikes during a period which throughout the world was one of unprecedented enterprise, was great stagnation in the supply of raw material, and all prices were considerably above the average; copper, iron, coal, lead—everything during the last year seemed to have an inflated value. There was labour unrest and a great difficulty in securing efficient men in skilled trades. At the present moment that symptom of labour unrest was still very much to the front. Some 50,000 men were out on strike in the Midlands to-day, and their own people were out last month for over a fortnight. He was pleased to say that they had now returned to work. Were it not for this uncertain state of affairs the outlook in the electrical industry continued to be hopeful. There was an ever-increasing demand for electrical power for use in small and big industries. Every day brought forward some new useful apparatus which brought electricity more and more into the service of man. They were on the threshhold of a big development in electrical heating and cooking. The greater perfection of tungsten lamps, of which their Osram was so prominent a type, was giving the electric light a renewed stimulus in its fight against gas. Thousands of the most able minds were occupied in evolving newer and still more efficient illuminants, and success seemed very probable. The development of wireless telegraphy and telephony was making rapid strides; the electrification of railways was coming fast. A moment's thought must give the assurance that a company such as theirs, interested in every branch of electrical engineering, keeping a watchful eye on every new manifestation of electrical activity, must see a bright future in those new and far-stretching vistas of useful work and progress.

MR. E. G. BYNG seconded the motion, and the report was adopted. Messrs. F. S. Sells and L. G. Byng were re-elected directors.

Electric Construction Co., Ltd.

THE twentieth annual general meeting was held on Tuesday, July 15th, at Winchester House, E.C., Mr. P. E. Beachcroft in the chair.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 69), after referring with regret to the death of Sir Irving Courtenay, the late chairman, said he was very pleased that the hope expressed by his predecessor last year, that they would be able to submit a better report this year, had been fulfilled, the net profit having increased from £20,364 to £27,501. The works had been fully employed and better prices had prevailed. They had been able to handle an increased output at comparatively little additional cost in the way of fixed factory charges, and the profit and loss account, therefore, got the full benefit of the improved trade conditions. The gross profit upon manufacturing and contracting showed an increase of £8,954, but interest, dividends, &c., had produced £311 less, owing to their having realised part of their holding in the Madras tramways. The net increase on the credit side of the profit and loss account was £8,643. On the debit side of that account there was a saving in debenture interest of £290. General charges, however, increased by £1,854. This was due partly to increased expenditure incidental to a larger output, and partly to contributions under the National Health Insurance Act. They had experienced little difficulty in the administration of the Act, but it was too early to judge whether employers would benefit by increased efficiency on the part of their employés, as was claimed by its promoters. Directors' fees showed a reduction of £225, the number of directors being one less than formerly. Maintenance of plant and buildings had increased £168. The net increase on the debit side of the profit and loss account was £1,507, leaving an increase of profit for the year of £7,136. The net profit amounted to £27,501, plus £5,694 brought forward, making £33,194 available for distribution. The directors recommended that this amount should be appropriated as follows:—Dividend of 7 per cent. per annum on the preference shares, £4,395; dividend of 5 per cent. per annum on the ordinary shares, £11,210; transfer to general reserve fund, £10,691; leaving a balance to be carried forward to next account of £6,899. Turning to the balance-sheet, on the assets side, there was only one item to which he need refer, viz., shares in other companies. During the year they sold a small part of their holding in the Madras Electric Tramways (1904), Ltd. Their holding in that concern now consists entirely of 6 per cent. preference shares, which they had decided to hold as an investment. These shares were now quoted on the Stock Exchange, and they had therefore transferred the value of this holding from "shares in other companies" to "investments," increasing the amount of the latter, at market value, to £29,887. The greater part of the reserve fund, amounting to £46,000, was invested outside the business, and the whole of the securities being of a marketable nature, their financial position was therefore greatly strengthened. In pursuance of the policy intimated last year, they had redeemed £12,700 of their 4 per cent. debenture stock reducing the amount outstanding to £170,000. Dealing with the position generally, they were entitled to congratulate themselves upon the progress of the past three of four years, and he did not hesitate to say that on no previous occasion had they presented a balance-sheet of a more satisfactory character. Their improved position was due in a large measure to unremitting attention to costs of production. To this end the board had consistently supported the management by sanctioning the installation of modern tools, the provision for depreciation being year by year expended on new, up-to-date appliances. They had also had the services of a staff second to none in skill and assiduity, and further, they had enjoyed complete harmony with the general body of their workpeople. The electrical industry, in his opinion, had only touched the fringe of the future, and he believed they were on the threshold of an era of prosperity in the industry generally. In their own case they had the advantage of having their plant so up-to-date that they were able to compete for any work which came along. In his

judgment the electrical machinery would be the motive power of the world in the future, and they were there to pick up any business which came their way. When they came to realise the enormous amount of work that there was to be carried out by the various electrical companies in this country alone and the comparatively small percentage which they obtained, and the satisfactory results they were able to show thereon, they had every reason to hope and believe that the company would get the full benefit of any increase in trade that came along. He was at the works at Wolverhampton in the previous week and was very pleased with the progress of the extension. When the extension was completed the works would be in a position to considerably augment the business, and that was his justification for the belief he had expressed that although they had had an exceedingly good year during 1912, in the future their output would probably be doubled.

MR. JAMES GRAY seconded the motion, and the report was adopted.

Newcastle-on-Tyne Electric Supply Co., Ltd.—Interim dividends of 2½ per cent. on the preference and ordinary shares respectively are announced.

STOCKS AND SHARES.

Tuesday Evening.

As sure as ever July comes round, so sure is the plaint certain to be raised that the Stock Exchange has never before, in all its existence, seen such times. Perhaps this year there is more reason than usual for the lament, because the prosperity of the country, the Balkan War, the tightness of money and the lack of confidence have all conspired to lay a depression upon prices such as the markets have not experienced for years past.

Investment business keeps the markets alive: of speculation there is next to none going on. The best illustration of this can be furnished by the American Railroad market. In normal days, or nights, many of the dealers remain until eight o'clock in the Street, tied there by orders arising out of the prices cabled from the Wall Street Stock Exchange. So listless has the American business become, that on Monday and Tuesday in this week the London market went home before half past five.

The Home Railway market is dull, though prices advanced on a sharp rally in Consols. Districts and Metropolitans show small recoveries. Central Londons are irregular. It will be noticed from reference to our price lists overleaf that there are now different quotations for the Ordinary stocks and the Guaranteed Assented stocks. The three Ordinary issues have become split into six sets of securities, and the Assented stocks all command higher figures than the others.

London United Tramways 4 per cent. Debenture stock continues depressed, and has fallen a further 2 points. The British Electric Traction group is also dull. Underground Electric Railways shilling shares are $\frac{1}{32}$ down, but the 6 per cent. Incomes are the turn better at 90.

English electricity supply shares retain most of their strength, and Chelseas are ½ up at 4¼. City of London Ordinary, however, reacted 10s. The few other changes which occurred are mainly on account of dividend deductions. Urban Debenture is a point to the good at 86½.

Affairs in Mexico are still very far from settled, and there can be no doubt that holders of Mexican investments are growing seriously uneasy at the protracted character of the country's troubles. Fresh falls have taken place this week in most Mexican descriptions, but Mexico Tramways Common shares rose superior, by ⅜, to the general flatness in this group. The Company's 6 per cent. bonds are 2 lower, and by a rather curious coincidence, its three quoted securities all stand now at 89—92. Mexican Light and Power Common shares have slumped 6 points on top of their fall of 3 last week, and the Preferred are 5½ lower at 92½. Brazilian Traction shares more than recovered their previous drop of 1½, but it must be admitted that the market in these seems none too sure of itself, Brazilian things as a whole being at the moment somewhat clouded by the uncertainty respecting rubber and coffee. Anglo-Argentine Trams are steady, the only change being a slight fall in the price of the Second Preference shares. Singapore Trams Debenture stock has been wanted, and the price gained 1½.

The Telegraph market is extremely quiet. Westerns are ⅛ down, and Panama Ordinary fell ⅛ to 2⅜; further than these there are no changes worth mentioning. National Telephone Deferred moved more or less languidly between 25½ and 27⅜, being better on the week at 27¼. New York Telephone Bonds are ½ higher. Marconis have been crumbling and recovering, the Ordinary and Preference showing falls of $\frac{1}{16}$ and ⅛ respectively, this on the prominence given to a competitive system of wireless telegraphy. No improvement has taken place in Reuters, the price remaining at 9½.

Prices in the manufacturing division showed trifling changes. Callenders gave way sharply upon an order coming in to sell about 500 shares on behalf of a deceased estate. The shares were placed, and the price recovered most of its fall. The Debenture stock is 1 down. Telegraph Constructions are quoted *ex* the dividend of 12s. Aron Ordinary and Preference are also *ex* dividend. The Rubber market, after a spasm of further weakness, pulled itself together, and its prices made a move upwards. The relative merits of Brazilian and plantation rubber are being hotly debated, and it would be of considerable practical value if those who are interested in rubber from the point of view of telegraph and other electrical works were to add the testimony of their experience.

MARKET QUOTATIONS.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, July 16th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric .. .. per cwt.	5/-	..
a „ Nitric .. .. .. „	22/-	..
a „ Oxalic .. .. .. per lb.	2¾d.	..
a „ Sulphuric .. .. .. per cwt.	5/6	..
a Ammoniac Sal .. .. .. „	42/-	..
a Ammonia, Muriate (large crystal) per ton	£29 10	..
a Bleaching powder .. .. .. „	£6 5	..
a Bisulphide of Carbon .. .. „	£18	..
a Borax .. .. „	£17 10	..
a Copper Sulphate .. .. .. „	£21	£1 10s. dec.
a Lead, Nitrate .. .. .. „	£27 10	..
a „ White Sugar .. .. „	£26	..
a „ Peroxide .. .. .. „	£32	..
c Methylated Spirit .. .. .. per gal.	2/6	..
a Potassium, Bichromate, in casks per lb.	8½d.	..
a Potash, Caustic (88/90 %) .. per ton	£23 10	..
a „ Chlorate .. .. .. per lb.	8½d.	..
a „ „ Perchlorate .. .. „	4½d.	..
a Potassium, Cyanide (98/100 %) .. „ (for mining purposes only)	7½d.	..
a Shellac .. .. per cwt.	85/-	..
a Sulphate of Magnesia .. .. per ton	£4 10	..
a Sulphur, Sublimed Flowers .. „	£8 10	..
a „ Recovered .. .. „	£5 10	..
a „ Lump .. .. .. „	£5	..
a Soda, Caustic (white 70/72 %) .. „	£10 5	..
a „ Chlorate .. .. .. per lb.	3¾d.	..
a „ Crystals .. .. .. per ton	£3 5	..
a Sodium Bichromate, casks .. per lb.	3d.	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£95	..
b „ Wire, in ton lots (1 to 14 S.W.G.) „	£121 6 8	..
b „ Sheet, in ton lots .. „	£126	..
p Babbitt's metal ingots .. .. „	£50 to £221	..
c Brass (rolled metal 2" to 12" basis) per lb.	8½d.	¼d. dec.
c „ Tube (brazed) .. .. „	9½d.	..
c „ „ (solid drawn) .. .. „	8¾d.	..
c „ Wire, basis .. .. .. „	8¾d.	..
c Copper Tubes (brazed) .. .. „	11½d.	..
c „ „ (solid drawn) .. .. „	10¾d.	..
g „ Bars (best selected) .. per ton	£80	..
g „ Sheet .. .. .. „	£80	..
g „ Rod .. .. „	£80	..
d „ (Electrolytic) Bars .. „	£66 10	£2 10s. dec.
d „ „ Sheets .. „	£84 10	£1 10s. dec.
d „ „ Rods .. .. „	£72	£2 15s. dec.
d „ „ H.C. Wire per lb.	8¾d.	¼d. dec.
f Ebonite Rod .. .. .. „	4/6	..
f „ Sheet .. .. .. „	4/-	..
n German Silver Wire .. .. „	1/10	..
h Gutta-percha, fine .. .. „	7/- to 8/-	..
h India-rubber, Para fine .. .. „	3/10	..
f Iron Pig (Cleveland warrants) .. per ton	55/6½	8½d. dec.
f „ Wire, galv. No. 8, P.O. qual. „	£14	..
g Lead, English Pig .. .. .. „	£20 2 6 to £20 5	7/6-10/- inc.
m Manganin Wire No. 28 .. .. per lb.	6/6	..
g Mercury .. .. per bot.	£7 5	5s. dec.
e Mica (in original cases) small .. per lb.	6d. to 8s.	..
e „ „ „ medium „	3/6 to 6/-	..
e „ „ „ large .. „	7/6 to 11/-	..
o Nickel, sheet, wire, &c. .. .. „	3/6 to 4/6 nom.	..
p Phosphor Bronze, plain castings „	1/1 to 1/3½	..
p „ „ rolled bars & rods „	1/0½ to 1/2	..
p „ „ rolled strip & sheet „	1/2½ to 1/5½	..
o Platinum .. .. per oz.	185/-	..
d Silicium Bronze Wire .. .. per lb.	10d.	..
r Steel, Magnet, in bars .. .. per ton	£55	..
g Tin, Block (English) .. .. „	£186 to £187	£9 dec.
n „ Wire, Nos. 1 to 16 .. .. per lb.	2/6	1d. dec.
p White Anti-friction Metals .. per ton	£50 to £228	..
k Zinc, Sh's (Vieille Montagne bnd.) „	£25	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
f Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n F. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

British Columbia Electric Railway Co., Ltd.—Dividend announced at the rate of 5 per cent. per annum on the 5 per cent. pref. ordinary stock for half-year ended June, together with an additional dividend at the rate of 1 per cent. per annum.

Marconi International Marine Communication Co., Ltd.—The Marconi's Wireless Telegraph Co., Ltd., has arranged for its shareholders to be able to apply for 94,395 shares of £1 each in the Marconi International Marine Communication Co., Ltd., at the price of £1 5s. per share.

Nairobi Electric Power and Lighting Co., Ltd.—The directors announce an interim dividend at the rate of 6 per cent. on the cumulative preference shares, in respect of the year 1908.

Fraser & Chalmers, Ltd.—Interim dividend of 7½ per cent. on the preference shares, less income-tax, payable on 26th inst.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations July 15th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord.	£10	5½	6	9½ — 10½	..	5 14 8
Do. 4½ % Pref.	£10	4½	4½	8½ — 9½	..	4 12 4
Do. Second 6 % Pref.	£10	6	6	10⅝ — 10⅞	..	5 12 11
Do. 4½ % Deb. Stock	Stock	4½	4½	94 — 96	..	4 13 9
Brompton & Kensington, Ord.	£5	10	10	8⅞ — 9⅛	..	5 9 7
Do. 7 % Cum. Pref.	£5	7	7	8½ — 8⅝	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	£100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	£5	5	5†	4⅛ — 4⅜	..	5 5 8
Do. 4½ % Cum. Pref.	£5	4½	4½	4⅛ — 4⅜	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	£5	4½	4½	8¾ — 4	..	5 12 6
Do. Do. 4 % Deb.	£100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	£5	5	4†	4⅜ — 5⅛	+ ⅛	4 17 7
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	£10	8	9	14½ — 16	— ½	5 12 6
Do. 6 % Cum. Pref.	£10	6	6	12 — 13	..	4 12 4
Do. 5 % Deb.	Stock	5	5	113½ — 117½	..	4 5 1
Do. 4½ % Second Deb.	£100	4½	4½	98 —100	..	4 10 0
County of London, Ord.	£10	6	6	10½ — 11	..	5 9 1
Do. 6 % Pref.	£10	6	6	11¼ — 11⅝	..	5 2 2
Do. 4½ % Deb.	Stock	4½	4½	102 —104	..	4 6 7
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£3	Nil	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	£5	Nil	8	4 — 4⅜ xd	..	3 8 7
Do. 6% Non-Cum. Pref.	£5	..	..	1⅜ — 2⅛	..	..
Do. 4½ % First Mort. Deb.	£100	4½	4½	81 — 84 xd	..	5 7 2
Folkestone	£5	6	6	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	£5	5	5	4½ — 5	..	5 0 0
Do. 4½ % First Deb.	£100	4½	4½	90 — 92	..	4 17 10
Hove	£5	9	9†	7½ — 7⅝	..	5 16 2

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations July 15th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Kensington & Knightsbridge, Ord	£5	9	8†	7½ — 7⅝	..	5 16 2
Do. 4 % Deb.	Stock	4	4	90 — 98	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	74 — 78 xd	..	5 15 5
London Electric, Ord.	£3	2½	2½	1⅛ — 1⅜	..	4 7 9
Do. 6 % Pref.	£5	6	6	4⅝ — 5⅛	..	5 14 8
Do. 4 % First Mort. Deb.	Stock	4	4	88 — 91	..	4 8 0
Metropolitan	£5	4	4†	8¼ — 8⅝	..	5 10 4
Do. 4½ % Cum. Pref.	£5	4½	4½	4⅛ — 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb.	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort. Deb.	Stock	3½	3½	73½ — 81½	..	4 6 0
North Metropolitan Power Supply, 5 % Mortgages (Red.)	£100	5	5	98 —101	..	4 19 0
Notting Hill, 6 % Non-Cum. Pref.	£10	6	6	9½ — 10½	..	5 14 8
Oxford	£5	7½	6†	5⅞ — 6⅜	..	5 13 9
St. James' and Pall Mall, Ord.	£5	10	10†	8½ — 9	..	5 11 1
Do. 7 % Pref.	£5	7	7	6⅝ — 7⅛	..	4 18 3
Do. 3½ % Deb.	£100	3½	3½	82½ — 85½	..	4 1 10
South London, Ord.	£4	5	6	2⅞ — 3⅛	..	7 7 8
Do. 5 % First Mort. Deb.	£100	5	5	96 — 99	..	5 1 0
South Metropolitan, 7 % Pref.	£1	7	7	1⅞ — 1⅞	..	5 17 11
Do. 4½ % First Deb. Stock	£100	4½	4½	96 — 99	..	4 10 6
Urban, Ord.	£3	Nil	Nil	⅞ — 1	..	..
Do. 5 % Cum. Pref.	£5	2	3	2⅜ — 2⅝	..	..
Do. 4½ % First Mort. Deb.	£100	4½	4½	85 — 88	+ 1	5 2 3
Westminster, Ord.	£5	10	10	8 — 8½	..	6 1 3
Do. 4½ % Cum. Pref.	£5	4½	4½	4⅞ — 5⅛	..	4 7 10

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	£5	6	6	5 — 5⅛	..	5 14 8
Calcutta, Ord.	£5	8½	8½	7 — 7⅛	..	5 13 4
Do. 5 % Pref.	£5	5	5	4⅛ — 5⅛	..	4 16 5
Calgary Power, 1st Mort. Bds.	£100	5	5	91 — 92	..	5 7 6
Canadian Gen. El. Com.	$100	7	7	108 —112	..	6 5 0
Do. 7 % Pref.	$100	7	7	118 —123	..	5 13 10
Cordoba Lt., Power and T., Ord.	£1	3	5	⅜ — ⅝d	..	6 8 1
Do. 5 % Deb.	£100	5	5	93½ — 95½	..	5 4 9
Elec. Lt. and P. of Cochabamba, 7 % Bonds	£100	6	6	90 — 92	..	6 10 5
Elec. Supply Victoria, 5 % 1st Mort. Deb.	£100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	92 — 94	..	5 6 5
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 3/32	..	Nil
Do. 6 % Pref.	£1	6	6	15/16 — 1⅛	..	9 12 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	99 —101	..	4 19 0
Madras, Ord.	£5	Nil	..	1¼ — 1⅜	..	..
Melbourne, 6 % 1st Mort. Deb.	£100	5	5	103 —106	+1	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	74 — 77	..	6 9 10
Mexican Lt. & Power, Common	$100	4	4†	57 — 60 xd	—6	6 13 4
Do. 7 % Cum. Pref.	$100	7	7	90 — 95	—5½	7 7 4
Do. 5 % 1st Mort. Gold Bds.	..	5	5	87 — 90	..	5 11 1
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	£100	5	5	76 — 79 xd	..	6 6 7
Montreal, Lt., H. and Power	$100	8	9†	210 —220	..	4 1 10
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	15 — 25	..	..
River Plate, Ord.	Stock	10	10	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	102 —107	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	£100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital	$100	5	5½	124 —128 xd	..	4 5 11
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	104½ —106½	..	4 14 0
Do. 4½ % Per. Deb.	Stock	4½	4½	98 —100	..	4 10 0
Toronto Power, 4½ % Deb.	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	£100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref.	£1	11¾d.	17⅜d.	11/16 — 13/16	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	£100	6	6	106 —108	..	5 11 1

TELEGRAPH AND TELEPHONE COMPANIES.

Anglo-American Telegraph	£10	4	4½†	6⅞ — 7⅛	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	93½ — 96½	..	5 4 9
American Telep. & Teleg., Cap.	$100	8	8	129 —132	..	6 1 3
Do. Collat. Trust	$1000	4	4	89 — 91	..	4 8 0
Anglo-American Telegraph	Stock	3	3	60 — 63 xd	..	4 15 3
Do. 6 % Pref.	Do.	6	6	107½ —108½ xd	+ ½	5 10 10
Do. Def.	Do.	30/-	30/-	23¼ — 23½	..	6 6 4
Anglo-Portuguese Tel., 5 % Mort. Deb.	£100	5	5	104 —106	..	4 15 8
Chili Telephone	£5	7	8	7⅜ — 7 13/16	..	5 2 5
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	83 — 85	..	4 13 7
Cuba Telegraph	£10	6	6	8¾ — 9¼	..	6 6 4
Do. 10 % Pref.	£10	10	10	15½ — 16½	..	5 19 4
Direct Spanish Telegraph, Ord.	£5	4	4†	8¼ — 8½	..	5 6 8
Do. 10 % Cum. Pref.	£5	10	10	6½ — 7½	..	6 12 0
Direct United States Cable	£10	5	4	6¼ — 6⅝	+ ⅛	6 0 9
Direct W. India Cable, 4½ % Reg. Deb.	£100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	124½ —127½ xd	..	5 9 10
Do. 3½ % Pref. Stock	Do.	3½	3½	78 — 76 xd	..	4 13 4
Do. 4 % Mort. Deb.	Do.	4	4	90½ — 93½	..	4 8 5
Eastern Extension	£10	7	7	12 — 12⅝ xd	..	5 12 0
Do. 4 % Deb.	Stock	4	4	91 — 93	..	4 6 0
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	£5	4	4	98½ —100½	..	3 11 7
Globe Telegraph and Trust	£10	6	6†	10⅝ — 11⅛	..	5 8 9
Do. 6 % Pref.	£10	6	6	12⅛ — 12⅝	..	4 15 1
Great Northern Telegraph	£10	18	20	30 — 32	..	6 5 0
Indo-European Telegraph	£5	13	13	55 — 57	..	5 14 0
Mackay Companies Common	$100	5	5	80 — 83	..	6 0 6
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	..	5 14 4
Marconi's Wireless Telegraph	£1	20	..	3⅞ — 3 11/16	— 1/16	5 8 6
Do. 7% Cum. Partic. Pref.	£1	17	..	2⅞ — 3⅛	— 1/16	5 8 9
Monte Video Telephone, Ord.	£1	6	6†	1 — 1⅛	..	5 6 8
Do. 5 % Pref.	£1	5	5	1/16 — 1/8	..	5 14 8
New York Telep., 4½% Gen. Bnds.	£100	4½	4½	97½ — 98½	+ ½	4 11 5
Oriental Telep. and Elec.	£1	8	10	1 3/16 — 1 7/16	..	5 8 6
Do. 6 % Cum. Pref.	£1	6	6	1⅛ — 1⅜	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	87 — 89	..	4 10 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	95 — 97	..	4 2 6
Reuter's	£10	10	10	9 — 10	..	10 0 0
Submarine Cables Trust	Cert.	6	6	124 —127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	94½ — 96½	..	4 13 8
United River Plate Telephone	£5	8	8†	6½ — 7	..	5 14 4
Do. 5 % Cum. Pref.	£5	5	5	5 — 5½	..	4 11 0
West Coast of America	2½	2½	..	1 3/16 — 1 5/16	..	4 3 4
Do. 4 % Debs., 1 to 500 guar. by Bras. Sub. Tel.	£100	4	4	93 — 96	..	4 1 8
West India and Panama Teleg.	£10	1½	1½	2½ — 2⅝	— ⅛	4 15 3
Do. 6 % Cum. 1st Pref.	£10	6	6	9½ — 10	..	6 0 0
Do. 6 % Cum. 2nd Pref.	£10	6	6	9½ — 10	..	6 0 0
Do. 5 % Debs.	£100	5	5	99 —101	..	4 19 0
Western Telegraph, Ltd.	£10	7	7†	12½ — 13	— ⅛	5 7 8
Do. 4 % Deb.	Stock	4	4	90½ — 92½	..	4 6 6
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	90 — 93	..	4 16 9

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations July 15th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	¾ — ⅞	..	Nil
Do. 5 % Pref.	1	5	5	3 29/32 — 4 1/32	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	72 — 77	..	5 17 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	8 — 10	..	..
Do. Do. Deferred	100	..	..	3½ — 5½	..	..
Do. Do. 6 % Cum. Pr'f	100	6	6	78 — 81	..	7 8 2
Do. 7 % Non-Cum. Pr'f.	100	..	3	38 — 41	..	7 6 4
Do. 5 % Perp. Deb.	100	5	5	90 — 93	..	5 7 6
Do. 4½ % 2nd Deb.	100	4½	4½	73 — 77	..	5 17 0
Central London Railway, Ord.	100	3	3	75 — 77	−2	..
Do. Gtd. Assented	100	..	..	73 — 81	+2	4 18 9
Do. Pref.	100	4	4	80 — 82	..	4 17 7
Do. Gtd. Assented	100	..	..	81 — 83	+1	4 16 5
Do. Def.	100	2	2	75 — 77	−1	..
Do. Gtd. Assented	100	..	..	77 — 79	..	5 1 3
Do. 4 % Deb.	100	4	4	97 — 99 xd	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	101 —103	..	4 17 1
Do. Do. 1898	100	5	5	100 —102	..	4 18 0
Do. Do. 1901	100	5	5	99 —102	..	4 18 0
Do. Do. 1903	100	5	5	99 —102	..	4 18 0
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Great Northern & City, Pr'f. Ord	10	Nil	Nil	1⅞ — 2⅛	..	Nil
Hastings Trams, 6 % Pref.	1	6	6†	7⅞ — 8⅜	..	7 13 7
Do. 4½ % Deb.	100	4½	4½	63 — 73	..	6 8 3
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2⅜ — 2⅝	..	4 15 3
Do. 4 % Deb.	100	4	4	73 — 73	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	76 — 78	..	6 8 2
London and Suburban, Ord.	1	..	..	3/32 — 1/32	..	..
Do. Do. 5 % Cum. Pref.	1	..	..	1/32 — 3/32	..	..
Do. Do. 4½ % 1st. Deb.	100	..	4½	70 — 75 xd	..	6 0 0
London Elec. Railw'ys, 4 % Deb.	100		4	91 — 93	..	4 6 0
London United Trams, 4 % Deb.	100	4	4	57 — 61	−2	6 11 2
Metropolitan Railway Consol.	100	1⅞	1⅞	46½ — 46¾	+ ⅛	3 9 6
Do. Surplus Lands	100	2⅜	2⅜	61 — 63	..	4 7 4
Do. 3½ % Deb.	100	3½	3½	88 — 85 xd	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	83 — 85	..	4 2 4
Do. 3½ % Con. Pref.	100	3½	3½	78 — 80	..	4 6 5
Metropolitan District Ord.	100	Nil	Nil	32⅜ — 33½	+1⅛	Nil
Do. 6 % Deb.	100	6	6	136 —139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	83 — 85	..	5 5 11
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 13 11
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	84 — 88	..	5 2 3
Do. 5 % Deb.	100	5	5	91½ — 94½	..	5 5 10
Potteries, Ord.	1	4½	..	3/32 — 1/32	..	..
Do. 5 % Pref.	1	5	5	1/8 — 1/4	..	7 5 6
Do. 4½ % Deb.	100	4	4½	82 — 85	..	5 6 0
South Metro. Trams, 6 % Pref.	1	..	..	3/8 — 3/4	..	8 0 0
Do. 4 % Deb.	100	..	4	63 — 68	..	5 17 8
Underground Elec. Railways	10	..	..	38⅛ — 38⅜	..	Nil
Do. "A"	1/-	4½	..	3/32 — 1/32	—32	Nil
Do. 6% First Cum. Inc. Deb.	100	14	6	108 —110	..	5 9 1
Do. 4½ % Bonds	100	Nil	4½	96 — 98	..	4 11 10
Do. 6 % Income	100	8	6 †	89½ — 90½	+ ½	6 12 7
Yorkshire (West Riding), Ord.	5	..	..	1/4 — 3/8	..	Nil
Do. 6 % Pref.	5	..	3½	3 5/16 — 3 13/16	..	3 18 8
Do. 4½ % Deb.	100	4½	4½	81 — 85	..	5 6 0

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4⅜ — 5	..	5 10 0
Do. 2nd Pref.	5	5½	5½	4¼ — 4½	— 1/16	6 2 3
Do. 4 % Deb.	100	4	4	90½ — 92½	..	4 6 6
Do. 4½ % Deb.	100	4½	4½	94½ — 96½	..	4 18 3
Do. 5 % Deb.	100	5	5	95½ — 97½	..	5 2 6
Auckland Trams, 5 % Deb.	100	5	5	99 —101	..	4 19 0
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 11½	+ ⅛	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 18 9
Do. 5 % 2nd Deb.	100	5	5	96 — 99	+1½	5 1 0
Brazilian Traction Light and Power	£100	..	6†	87 —89	+2	6 14 10
Brisbane Trams Invt., Ord.	5	8	8	6⅞ — 7⅜	..	5 8 6
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 8 11
Do. 4½ % Deb.	100	4½	4½	97 —100	..	4 10 0
B. Columbia Elec. Rly., Def.	100	8	8†	121 —126	..	6 7 0
Do. Pref. Ord.	100	6	6	110 —115	+1	5 4 4
Do. 5 % Pref.	100	5	5	101 —104 xd	..	4 16 2
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —102	..	4 8 8
Do. 4½ % Con. Deb.	100	4½	4½	95 — 97	..	4 7 8
Calcutta Trams, Ord.	5	7	5†	5⅜ — 6⅛	..	5 14 3
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	4 18 9
Do. 4½ % Deb.	100	4½	4½	95½ — 98½	..	4 11 5
Cape Electric Trams	1	2½	5	1¼ — 1⅜	..	6 8 1
City Buenos Aires Trams (1904)	5	5	5†	5⅛ — 5⅜	..	4 10 11
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90½ — 94½	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ - 98½ xd	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	1/16 — 3/16	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 6 % B Deb.	100	6	8	25 — 35	..	..
La Plata Elec. Trms, Ord.	1	Nil	..	1/32 — 1/32	..	..
Do. Pref.	1	6	..	3/32 — 1/32	..	5 16 6
Lisbon Elec. Trams, Ord.	1	6	4½d.	1 3/32 — 1 1/32	..	4 9 8
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr. 6% Cum. Pref.	5	..	6	4⅜ — 5⅛	..	5 17 1
,, Elec. Tr. (1904), Deb.	100	5	5	101 —103 xd	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87½ — 90½	−2½	5 10 6
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½ —100½	..	4 19 6
Mexico Trams Com.	$100	7	7†	89 — 92 xd	+ ¾	7 12 2
Do. Gen. Con. 5 % Bonds	..	5	5	89 — 92	..	5 8 8
Do. 6 % Bonds	100	6	6	89 — 92	− 2	6 10 5
Para Elec. Rlys. & Lt., Ord.	5	10	10	6 — 6½	— ⅛	7 13 10
Do. 6 % Pref.	5	6	6	4⅜ — 5	..	6 0 0
Do. 5 % 1st Deb.	100	5	5	98 —100	..	5 0 0
Perth (W.A.) Elec. Tr., Ord.	1	5	5½	1⅛ — 1⅜	..	4 0 0
Do. 5 % 1st. Deb.	100	5	5	102½ —105½	..	4 14 9
Rangoon El. Tr. & Sup., Pref.	5	6	6	5½ — 5⅞	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	96 — 98	..	5 2 0
Do. 5 % Mort. Bonds	100	5	5	91 — 93	..	5 7 8
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	£500	5	5	99 — 101	..	4 19 9
Singapore Trams, 5 % Deb.	100	5	5	85 — 89	+1½	5 12 4
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	7	4⅜ — 4⅞	..	7 3 7
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	..	5 1 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	98½ -101½	..	4 8 9

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	⅜ — 13/32 xd	..	7 7 8
Do. 6 % Pref.	1	6	6	13/32 — 15/32 xd	..	7 2 6
Babcock & Wilcox	1	28	16	2⅛ — 8⅛	..	5 4 5
Do. Pref.	1	6	6	1¼ — 1⅜	..	4 7 3
British Aluminium, Ord.	1	Nil	..	1 — 1	..	..
Do. 6 % Cum. Pref.	1	Nil	6	1/4 — 3/8	..	5 17 2
Do. 5 % Prior Lien Debs.	100	5	5	91 — 94	..	5 4 2
Do. Deb. Stk.	100	5	5	83 — 86	..	5 16 8
B.I. & Helsby Cables	5	10	10	7⅞ — 8	..	6 5 0
Do. Pref.	5	6	6	5⅞ — 6⅜	..	4 14 1
Do. Deb.	100	4½	4½	99 —102	..	4 8 3
British Thomson-Houston, Deb.	100	4½	4½	97 — 99	..	4 11 0
British Westinghouse, Pref.	8	Nil	Nil	3/8 — 11/16	..	Nil
Do. Deb.	100	4	4	65 — 69	..	5 16 0
Do. 6 % Prior Lien	100	6	6	99 —102	..	5 17 8
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ¼	..	Nil
Do. 6 % Prior Lien Deb.	100	5	5	70½ — 75½	..	6 12 5
Do. 4½ % Deb	100	4½	4½	38 — 43	..	10 9 4
Do. 4½ % Second Deb.	100	4½	4½	23 — 27	..	16 13 4
Callender's Cable	5	15	15	10¾ — 11½	— ¼	6 13 4
Do. Pref.	5	5	5	4 13/16 — 5 1/16	..	4 18 9
Do. Deb.	100	4½	4½	98 — 99	—1	4 10 6
Castner-Kellner	1	20	20	36 — 38	..	5 6 8
Do. Deb.	100	4½	4½	109 —106	..	4 4 11
Crompton & Co.	..	..	..	.. — ..	..	..
Do. Deb.	100	5	5	54½ — 59½	..	8 8 0
Dick, Kerr	1	5	Nil	5/- — 5/-	..	..
Do. Pref.	1	6	6	32/- — 33/-	..	7 13 10
Edison & Swan, A, £8 paid	5	Nil	..	0 — ⅛	..	Nil
Do. fully paid	5	Nil	..	1/2 — 1/2	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62 xd	..	6 9 1
Do. 5 % Second Deb.	100	5	5	65 — 70	..	7 2 10
Electric Construction	2	3½	5	1½ — 1⅝	+ ⅛	7 5 6
Do. Pref.	2	7	7	1⅞ — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8	..	8 8 8
Do. Deb.	100	5	6	92 — 94	..	5 4 9
General Electric, 6% Pref.	10	5	6	9⅜ — 10½	..	5 14 3
Do. Deb.	100	4	4	89 — 94	+1	4 5 1
Henley's, Ord.	5	15	15	12 — 12⅝	..	5 17 8
Do. Pref.	5	4½	4½	4⅜ — 5	..	4 10 0
Do. Deb.	100	4½	4½	99½ —101½	..	4 8 8
India-Rubber, G. & T.	10	..	7½	11 — 12	..	6 5 0
Do. Pref.	10	5	5	9 — 10	..	5 0 0
Telegraph Construction	12	17½	20	34½ — 36½ xd	..	6 11 7
Do. Deb.	100	4	4	94 — 97	..	4 2 6
Willans & Robinson	1	Nil	..	1/16 — 3/16	..	Nil
Do. Pref.	5	Nil	..	1/- — 3/-	..	Nil
Do. Deb.	100	4	4	55 — 57	..	7 0 4

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 4½ per cent., April 17th, 1913.

CABLE LAYING AND RECORDS.

BY W. E. H.

MY object in writing this article is to emphasise the necessity of employing some system in laying cables and the recording of such on suitable maps, and keeping a proper book to be used in conjunction with the maps.

The writer's first experience of actual records dates back about 16 years, when very little method was adopted, and the records kept were on all fours with those existing in the offices of gas and water companies. No doubt these people made very good records when the pipes were originally laid, but no notice was taken when road improvements, such as widenings, setting back pavements and alterations to frontages, took place. This method was generally practised in electrical main laying, and the records consisted of nothing more than measurements commencing at a street corner, with measurements at right angles, say, 20 to 40 ft. apart, where the depth of the conduit or main was taken. If the work was specified to be done by the contractors, as was done in a great many cases, very imperfect records were the result, and great was the trouble experienced by the mains department on such jobs. The writer knows of one such case where the work was part of the contract and one junior draughtsman was engaged. There were five gangs of men employed in different parts of the town, the work was done in a very slipshod manner, and the records were of very little use when completed. The positions were in some cases yards out, also the runs of cable were 3 or 4 ft. from the positions actually laid down on the maps; in addition to these slight errors the positions of the feeders were wrongly indicated. The latter were, however, put right when it came to coupling up at the station; had this not been done, it will be readily understood what might have happened when it came to opening up on some future occasion.

I have always made a point in recording of having every available piece of information entered up. First of all, the starting point is fixed from every conceivable position, taking measurements from the house line to the conduits or cable, and from the kerb line to the conduits or cable, picking up bench marks and fixing the depths from these. Where the crossings of roads come in, enlarged sections are made, giving full information of obstructions and positions, depths, size and nature of such obstructions and the dates when such work was carried out. From the above information the position of mains can be located at all times, for in every borough surveyor's or County Council's office are deposited the plans showing the nature of every roadway or building improvement, and from these records, together with the information originally taken, the mains departments of the future need have no fear of lost cables.

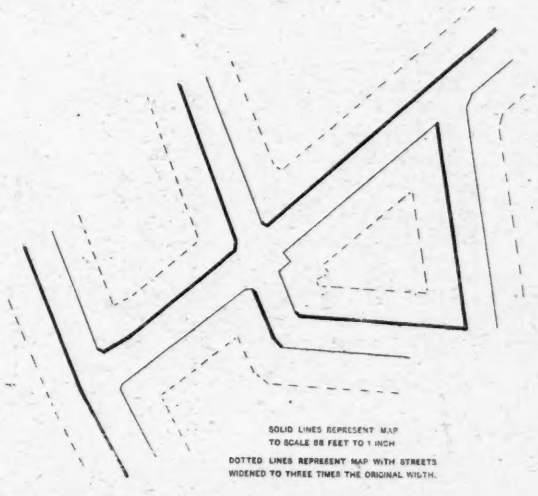
The writer some time ago had occasion to take up new duties upon a job where the mains were laid a great number of years ago, and the recording was placed in the hands of the cable-laying company; here it was found that the information was practically useless. The system was mainly armoured, laid direct in the ground and jointed by means of buried joint boxes, the positions of joints were given in a very vague manner, such as "18 yards from the entrance gate of the Laurels." The "Laurels" has now two gates (when the cables were laid it may have had only one). No mention was made of the direction, whether north, south, east or west of such a position. Another instance gives a joint as being outside "Manor House." "Manor House" has a frontage of 130 ft. No doubt this method was quite all right when the mains were laid, and the mains engineer was in close touch with all that was going on, and the whole job was an open book to him, but it is not quite fair to his successor, even granting that the successor was his assistant at the time the original work was done.

Another mistake that appears to have been made on the job in question were that of wrongly charting the direction of the feeders in a road where six or seven feeders branched off. The positions were, in the first place, wrongly marked, and secondly, wrongly traced.

When a break-down occurred, the department was informed that such and such a feeder had broken down. The maps were consulted and the direction noted, the original log-book was looked up, and joints noted; it was then found impossible to locate the joints from these records, so a start was made on the cable. The position of the fault was located by tests, and a jointer was dispatched to cut the cable. Strict instructions were given that great care was to be exercised, as doubt was very strong in the mind of the engineer as to the correctness of the information. It was found, upon cutting, that it was the wrong feeder. A joint was temporarily and quickly made, and another attempt was made; a second feeder was cut, and this proved to be alive. The faulty feeder was eventually found on the opposite side of the road. The engineer has since had the positions of the feeders definitely fixed at certain points of their routes. To do this it was, however, necessary to cut all the remaining feeders and test thoroughly.

To improve the records and make them more trustworthy, a card was introduced whereon all the information respecting cables, joints, and joint boxes is entered up from openings made by the service gang. The particulars consist of noting the number of cables, sizes and conditions found, particulars of joints made, and to which pole the connection is made, size of conductors of the mains cut into, position of joint from party walls of the property connected, together with distance from line of frontage and line of kerb.

The same method is employed in the case of openings of any kind that are made in the streets by any of the other companies. (Notices of all openings are sent to the department by gas, water, and telephone companies.) It will be seen that much valuable information is gained in this manner, and in a surprisingly short time fairly accurate records are prepared.


SOLID LINES REPRESENT MAP
TO SCALE 88 FEET TO 1 INCH
DOTTED LINES REPRESENT MAP WITH STREETS
WIDENED TO THREE TIMES THE ORIGINAL WIDTH.

A great deal of time has, however, been lost owing to lack of information as to the direction taken by services in cases where the gardens fronting the properties connected are of considerable depth. Many instances have cropped up where a service tapping was made in the road fronting the house and the cable laid in a snake-like fashion, finally entering the house in the rear.

It is not the writer's object to advocate or institute a system of planning each house service, but, at the same time, he is of opinion that a carefully trained service layer can note in a few words the route taken, and at the same time place some mark upon the wall or kerb which will greatly assist should there be urgent need to open the ground at any time.

It has been the practice for a certain company to mark the position of each joint under the paving by inserting a small tablet in the pavement immediately over the joint. This system held good and was very useful until the time came for relaying the pavements. When the tablets came to be put back, they were placed in any position that took the fancy of the paviors—in many instances, some feet away from their original and intended positions.

Elaborate methods are sometimes used. I know of one job where the engineer's idea was to have the ordnance maps (88 ft. to 1 in.) mounted and feeders shown

thereon by means of coloured strings fixed by pins. This worked well for a time, until the system grew to such an extent that very little of the map was to be seen, and what there was resembled a crazy-work cushion. The most sensible diagram is one that is easily prepared and may be taken from the ordnance sheet, the direction and general features remaining, but the streets being widened to three or four times the width of those shown on the scale maps. Upon this class of map all the required information can be accurately placed, and it takes up no more space than the ordnance maps of the district. A sketch of such a plan is given on the preceding page.

CONDUIT LAYING, THEN AND NOW.

[COMMUNICATED.]

THE method of laying cables is a question that crops up with every extension that comes up for consideration, and one that has been food for discussion for some years past. The early systems that adopted the draw-in method had to be content with either cast or wrought-iron, or a composite bitumen conduit built up to suit one's taste. The latter method was very good from the point of view of laying and jointing, but the trouble of getting cables in or out was endless.

The writer proposes to deal with the several types of conduit used during the last 15 years, the method of laying, and the ideas of those responsible for the laying.

On one of the London Borough Council's undertakings, where a draw-in system of Doulton cement jointed conduits was adopted, the consulting engineer (his first job of this kind) to ensure a fall between draw boxes, insisted that a level (not the ordinary spirit level, but a level of the Dumpy type) should be used on each duct before it was finally bedded down. Imagine the poor Clerk of Works spending the entire day gazing through a spy-hole and plotting the fall of each two-foot length of duct, on sheets of squared paper, to say nothing of the hindrance caused to the contractors, who had to lay about 20 miles of such ducts. The speed of laying was restricted to about 40 yd. daily per gang. Needless to say, after the first few days of such childishness, the Clerk of Works gave up the spying practice, and the rate of progress jumped up to about 100 yd. daily, which was in those days a capital day's run. The squared paper chart was, of course, kept going, but its accuracy was not vouched for.

The conduits laid were of a good size, and allowed of large cables being drawn into them with perfect ease, which differed greatly from the writer's later experience of a consulting engineered scheme of conduit laying in another of our Metropolitan boroughs. The ducts specified were Doulton 2 in. square, jointed with a mixture of something like bitumen, sand, brimstone and other ingredients, which prevented speedy laying in warm weather. These particular ducts were laid into a cast-iron bed-plate; a second casting fitted over the top of the duct, and together with the bottom half acted as a mould for the composition joint. Inside the duct was placed a mandrel which, when fitted and screwed up, prevented any of the molten composition from getting into the duct. Great care had to be used in drilling the men to do the right thing; when, however, this was accomplished, a very satisfactory job was the result. The process of laying was a tedious one on account of the exceedingly warm summer—resulting in warm moulds and language. However, the troubles of duct laying were slight compared to what was to come. On another part of the system, where in the roadway 2-in. cast-iron pipes coated inside and out with the compound, were laid, and draw boxes 120 yards apart, a ·2 sq. in. concentric lead-covered cable, juted and compounded, of an overall diameter of 1·4 in., had to be drawn into one of the pipes. The first length that was attempted took one winch and eight men three hours to draw a distance of about 100 yards, when the eye splice on the cable parted. The ground had to be opened, and a further attempt was made, but to no purpose, and, finally, a brickbox was built at this point. The greatest amount of cable drawn in on any one day of 10½ hours was 320 yards.

On another job, where small ducts and large cables were specified, 2½ in. ducts were used for the purpose of drawing in a ·4 sq. in. segmental concentric lead-covered, juted, and compounded cable, the overall dimensions of this cable being over 2 in.

The draw-in boxes were 80 yards apart. A winch was used for the purpose of drawing in the cable, after many struggles, in one of which the winch collapsed when the cable was rather more than half way through, and, finally, after several attempts the pavement had to be opened up and a drawbox built.

I should like to mention that the specification called for drawboxes of two styles; no dimensions were stated, but they were described as "square shape" and "long shape." The omission of definite dimensions led to trouble, and the consulting engineer agreed that the square-shaped boxes were to be 2 ft. 6 in. by 2 ft. 6 in., and the long-shaped boxes 2 ft. 6 in. by 1 ft. 6 in. The larger-sized boxes were built where the number of ways ranged from 6 to 18, and into these boxes had to be crowded an equal number of joints, and in some cases a low-tension disconnecting box. The look of some of the boxes when the whole of the cables were in beggars description.

This same engineer had rather curious ideas of service connection in conjunction with a draw-in system. The plan laid down was that the house side duct of a nest of conduits was broken away for a length of 2 ft. (one length of conduit), and the slack in the cable eased out so that a service box could be put on.

This being done, the duct was made good by means of a special earthenware cover designed to fit over the open duct and provided with a socket attachment for receiving the pipe in which the service cable was laid. What actually happened on this line of 2-in. conduits, in which was laid a ·2 sq. in. distributor, was that, upon opening the required amount of duct, no slack was to be had, and it was impossible to fix the service box until the inside duct was broken into; this being done, the special earthenware attachment was found to be of no use, and a brick box was built enclosing the damaged duct. This, as the reader will have observed, partly destroyed the use of one way, and upon new cable being laid, some years later, it was decided to use the spare way, when it was found necessary to open up between 60 to 70 services for the purpose of rodding and afterwards drawing in cable—a very costly proceeding.

It had, however, the desired effect, and proved a valuable lesson to the individual responsible for the further extensions, in which ample room was allowed in conduits, and the draw-in boxes were like young dwelling houses.

To-day, as yesterday, engineers are divided on the type of duct to use and the method of laying. Some few favour the use of wrought-iron pipes; I have seen some peculiar results with pipes of this kind that have only been in the ground eight to ten years. Others continue the use of cast-iron, well coated with preservative compounds. Also engineers who are faithful to earthenware ducts prefer to use single-way conduits, and build up to form nests of any number. The ducts used are 3 in. diam., with ordinary cement joints, and are claimed to make the best and cheapest job. This claim is open to considerable doubt; in the first place, if more than one-way is being laid, it is a hundred to one that the pipe-layer does not make a perfect cement joint, and if the ground is charged with water, the result is a very leaky job.

Again, in forcing home the duct, small particles of cement get into it (we know that a mandrel is supposed to be used for the purpose of clearing away any cement that may get into the duct, but this is not often done). Also, where a nest of ducts are laid, it is necessary to concrete the whole lot together at specified intervals, otherwise they will spread with the sinking of the ground, and, consequently, get out of alignment; if this is not done, they are a great trouble to other contractors opening trenches adjacent to the route.

The conduit that appears most suitable from all points of view is that with a self-centring joint. They make a good water-tight job, are most speedy to lay, and give perfect alignment. There is no cement to get into the ducts, and very little supervision is required on the part of the Clerk of

Works, and it is absolutely the cheapest earthenware duct to lay.

If single conduits are built up in concrete there is no doubt that the palm goes to the fibre ducts. They are light, the cost of cartage is small, they are the easiest to handle, and, provided a good mixture of concrete is used, a good all-round job is the result. The writer has had a good experience with this class, and the results have been satisfactory.

In passing, I strongly urge the use of liberal sizes of draw-in boxes; many of the boxes built in the early days were so absurdly small that even the beetles had difficulty in turning round in them, and the jointers had to perform all sorts of acrobatic feats to carry out the necessary work.

On one job in my experience large boxes were the rule, but absurdly small frames and covers, and these were placed in such a position that when the cable had to be drawn in, the whole frame and cover and part of the box had to be removed.

REVIEWS.

Psychology and Industrial Efficiency. By HUGO MUNSTERBERG. London: Constable & Co., Ltd. 1913. Price 6s. net.

It is not so long since we were introduced to a new industrial science known as "Motion Study," which may be described as the scientific investigation of bodily motions as applied to industrial purposes. The book under review deals with what may be called the motions of the mind with a similar end in view.

Although the matter set forth is based upon a recent work written in German by the same author, both the experiments and the examples referred to are drawn from experience in the United States, where this movement seems to have originated.

After a somewhat lengthy introduction, the subject is treated in three sections, which deal respectively with psychology as applied to obtaining the best possible man (or woman) for any particular duty, the best possible work from employés, and the best possible effects with special reference to advertisements, display, &c.

The application of psychology to industrial problems will be more quickly understood from one or two examples than by any amount of explanation. For instance, some very interesting experiments were carried out bearing upon the getting of the best possible motormen for driving electric tramcars. Important though this problem is in this country, the number of accidents is much more serious in large American cities, and it is very desirable that good drivers be obtained.

The following passage explains the problem to be solved:—

"The companies claimed that there are motormen who practically never have an accident, because they feel beforehand even what the confused pedestrian and the unskilled chauffeur will do, while others relatively often experience accidents of all kinds because they do not foresee how matters will develop."

The apparatus used to test the men gives a very fair representation of the motorman's difficulties when driving through traffic, the street being represented by a series of cards showing the track, with numerous figures to represent pedestrians, horse vehicles and motor-cars. The figures which will cross the track are marked in red, and an opening in a black screen travels over the cards one after the other to represent the motion of the tramcar. The track is divided into spaces marked with the letters of the alphabet, and the motorman is asked to call out each space by its letter, where a red figure will strike the track as the cards are traversed. The results are measured by the time taken to go through 12 cards, and the number of places omitted where red figures would land on the track.

The capacity of the motormen to get through the cards quickly with few omissions was found to correspond with their ability to keep time and avoid accidents on the cars; moreover, the men themselves admitted that the apparatus gave them a similar feeling to that actually experienced when driving.

Some may contend that driving a car without accidents is entirely a question of training, but this contention is disposed of by the results from the author's advanced students in research work, which were better than any from the best motormen of many years' standing.

It may be easily understood that a test of this nature applied to candidates for employment as drivers would be invaluable, by excluding a number of men whose mental equipment was unsuitable for the duty required.

Experiments of a different type were tried with telephone operators, and here, again, the results tallied with the known capabilities of the persons experimented on. These investigations were particularly useful in weeding out unsuitable candidates, who would otherwise receive a long training at the expense of the telephone companies, who maintain a school for this purpose.

Rejection by psychological tests of this nature is no reflection upon the applicant's intelligence, it simply means that he or she can never become proficient in certain lines, hence any time spent on training would be wasted. If these principles can be carried to their logical conclusion immense benefits must accrue to industry in general, as each boy or girl can be tested before entering commercial life, and we shall have no more square pegs in round holes.

For obtaining the best possible work, it is rather difficult to define where "motion study" ends and the application of psychology begins. In so far as all muscular effort has its effect upon the brain, it would seem that the study of bodily motions involves some consideration of their effect upon the mind and *vice versâ*.

The teaching of telegraphy and typewriting offers favourable conditions for the application of psychology, and the training for typists has already been much simplified by a study of this nature. Almost all industrial operations lend themselves to similar treatment, varying in extent according to the amount of brainwork involved.

In a chapter on "The Adjustment of Technical to Physical Conditions," the author states that "the psychological effect of colours and noises has not been fructified at all for industrial purposes." . . . . "The labourer, for instance, usually believes that a noise to which he has become accustomed does not disturb him in his work, while experimental results point strongly to the contrary. In a similar way the effect of coloured windows may appear indifferent to the workman, and yet have considerable influence on his efficiency."

The effect of signals by eye, ear, or touch, is also dealt with, and it is urged that the conditions be kept the same where similar effects are desired. Railway signals are given as an example, the difference between arm signals by day and coloured lights by night being deemed a bad feature, and replacement of the lamps by lines of lights on the signal arms is suggested, so that the engine-driver will always have the same type of signal to read.

Under the heading of "The Economy of Movement," the importance of not suddenly stopping movements, if it can be avoided, is emphasised, as "Any interruption of a movement presupposes a special effort of the will which absorbs energy, and after the interruption a new start must be made of which the same is true. On the other hand, if chains of movements become habitual, the psychophysical effort will be reduced to the minimum, inasmuch as each movement finds its natural end, at the same time each movement itself becomes a stimulus for the next movement by its accompanying sensations."

Of particular interest is the problem of monotony in modern factories, which is dealt with at some length, and according to the author's investigations, the operators with the most monotonous jobs suffer no discomfort from this feature even when extended over many years, while "others who seemed to have really interesting and varied activities nevertheless complained bitterly over the monotonous, tiresome factory labour." These investigations were directed towards tests to show whether an individual will suffer from repetition in work.

The third and last section of the book treats of the satisfaction of the demands of the consumer, the effect of

advertisements and displays, illegal imitation and buying and selling.

Altogether this work contains a great deal of useful matter, although the subject is dealt with in rather too technical a manner to suit commercial readers. It must be remembered, however, that this new industrial science is only in its infancy; but sufficient practical application has, we think, been shown to justify further investigation.

Methods of Measuring Electrical Resistance. By EDWIN F. NORTHRUP, Ph.D. London: Hill Publishing Co. Price 17s. net.

There is probably no scientific operation performed more frequently than the measurement of an electrical resistance; and there are probably more methods of finding resistance than any other physical quantity.

But although other branches of physics of far less practical importance have bulky volumes devoted to them, the discussion of resistance and its measurement is usually left to the writer of the general text-book of electricity, with the result that only the main principles and a few important methods are described. It is, in fact, almost impossible to find a complete collection of the various methods of measuring resistance as applied to the multitude of different conditions under which such measurements have to be made in practice.

The book before us does provide such a collection, and while it is not claimed that the book is exhaustive, the author has selected "all methods which in his judgment are useful for commercial tests and measurements, for purposes of instruction in educational institutions, and for application in technical and research laboratories." He has felt justified in writing upon methods of measuring electrical resistance because he has been engaged in electrical measurement for over 20 years, first with an important American instrument company and later in the Palmer Physical Laboratory at Princetown University. Dr. Northrup has certainly used his wide experience with good effect in the production of this useful work.

In the introductory chapter some wise comments are made upon accuracy and method of measurement, and the question of sensibility is discussed. Another matter, too, which is of considerable importance in all physical measurement is treated at some length — the Theory of Errors— part of the section having been taken from "Instruments et Méthodes de Mesures Electriques Industrielles," by H. Armagnat.

Chapters II and III deal with deflection methods and null methods respectively, and provide a good general groundwork on which to base the more elaborate discussion of Wheatstone's Bridge methods. Although the Wheatstone network is treated with great thoroughness, and such modifications as the Carey-Foster method and the Kelvin-Varley slide have received space proportional to their importance, the English reader will be struck by the absence of any reference to the common form of Post Office Box, at least under that name. A paragraph on this essentially English method of measuring resistances would have assured Dr. Northrup's book of a better welcome in English institutions. The omission of any mention of such standard instruments because they are not American and the use of the painful contraction "thru" are among the few regrettable features of the book.

The measurement of low resistances is dealt with in a chapter of great practical value. The Kelvin double bridge method is applied wherever possible, "being pre-eminently the most accurate and elegant," and alternative methods are also described in some detail.

The chapter on "Conductivity" inserted at this point in the book seems to be unduly laboured and out of place, but the author probably considers it to be a necessary introduction to the study of high-resistance measurement, which in its turn leads to insulation testing—both of which are fully treated in separate chapters.

A very important subject which receives scanty attention in most text-books is the measurement of resistance to alternating currents and its application to electrolytic resistances. Two chapters are devoted to it in this book, and all the standard methods devised by Kohlrausch and others are described, as well as some of the more recent work.

Two other subjects are considered, viz., the localisation of faults and the measurement of temperature, and in these the general excellence of treatment is maintained. In the latter section we have the unusual experience of seeing a *correct* diagram of connections for a platinum resistance thermometer, and this in spite of the fact that the author considerably under-estimates the importance of Prof. Callendar's work on this subject. The "compensation" principle is not attributed to him as it should be, and no mention is made of either the Callendar-Griffiths bridge, or the Callendar continuous indicator.

The last chapter describes and tabulates the capabilities of the various types of deflection instruments in use for resistance measurements.

Altogether, this book deals with the subject in a complete and workmanlike manner, and will rank as a standard work on resistance measurement.—P. K.

BRITISH TRADE WITH CANADA.

THE following are extracts from a valuable report on the trade of Canada issued by the Board of Trade and prepared by Mr. C. Hamilton Wickes, H.M. Trade Commissioner in Montreal, to which we refer in our leader on page 81. The report itself can be purchased from Messrs. Wyman & Sons, at a cost of 3d.

TRADE STATISTICS.

Preliminary figures of the trade of Canada during the 12 months ended March 31st, 1913, show that, excluding bullion and specie, imports amounted to £141,100,000 as compared with £109,620,000 for the preceding year, an increase of about £31,500,000, or 28½ per cent. The value of the exports of merchandise was £80,800,000, an increase of £17,500,000 as compared with 1911-12. The value of the imports of merchandise from the United Kingdom was £28,700,000, an increase of £4,610,000, or 19 per cent. Goods imported from the United Kingdom free of duty were valued at £6,326,000, an increase of £700,000, or over 12 per cent., whilst imports of dutiable goods from the United Kingdom amounted to £22,380,000, an increase of about £4,000,000, or 21 per cent. over 1911-12.

The imports into Canada from the United Kingdom have steadily grown in value since 1897. In that year imports from the United Kingdom were at the low value of $29,400,000 (about £6,000,000). By 1902 imports from the United Kingdom had advanced to $49,200,000 (about £10,000,000), and for the fiscal year ending March 31st, 1912, to $117,000,000 (about £23,500,000).

Considerable as has been the rise in the imports into Canada from the United Kingdom in the last 16 years ($87,600,000), it has not kept pace with the remarkable expansion in the total value of imports into the Dominion from all countries. During the period 1873-1897, imports from the United Kingdom steadily declined from $68,500,000 to $29,400,000, *i.e.*, from 53·5 per cent. (1873) to 24·6 per cent. (1897) of the total import trade. In the following year (1898) the value of imports into Canada from the United Kingdom showed an increase of $3,000,000 (about £600,000), and has continued to advance annually since that year. In April, 1897, the Canadian Government inaugurated preferential Customs treatment for goods imported from the United Kingdom to the extent of ⅓th of the duties payable under the General Tariff (since increased to an average of ¼rd), and it will be noted that imports into Canada from the United Kingdom began to show an increase in the year following, an increase which has been maintained without interruption year by year since that date; the expansion in the total imports into Canada began about two years before, *i.e.*, in 1895-96. Between 1896-7 and 1912-3 imports from the United Kingdom for consumption in Canada quadrupled in value, but, nevertheless, the proportion of imports from the United Kingdom to the total imports from all countries showed a decline of 7·3 per cent.

I am not, however, prepared to go so far as to believe that this loss of percentage by the United Kingdom in the import trade with the Dominion has been due to any general decrease in the competition for trade. In fact, certain individual firms of the United Kingdom have within the last three or four years not only taken their share of the increased trade but have actually secured trade which formerly went to the United States. British manufacturers are taking a greater interest and are watching this market with greater attention, but I fear a number have not realised the extraordinary expansion which has taken place in the last few years; and many lines have been either overlooked or the volume of business to be done has not been fully appreciated.

The Dominion of Canada in common with other countries felt the pressure of the financial situation towards the beginning of the autumn of 1912. Financial interests in the Dominion have steadily tightened the strings throughout the winter, and the effect has

been noticeable in the west as well as in the commercial centres of Montreal and Toronto; so much so that some of the municipalities in the west which had entered into contracts to purchase machinery and material have had to delay settlement, although the contractors have delivered or have been ready-to deliver under the contracts made. In view of these conditions the facility with which some important western municipalities have raised loans in the London market is a matter for some surprise. A result of the land boom has been the locking-up of a great deal of capital in real estate, thereby hampering the conduct of ordinary business.

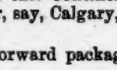
BRITISH TRADE METHODS.

Some British manufacturers have recently opened branch establishments in Canada, and others have been investigating the conditions here with a view to initiating similar enterprises. Representatives of British manufacturers in Canada, as well as Canadians, express the opinion that the starting of branch establishments in Canada will assist the importation of British goods and that, in some cases, it is almost essential to start branch works for the purpose of assembling and manufacturing, in order to secure a due share of the expanding trade of the Dominion. One or two British merchant firms, as distinct from manufacturers or their representatives, have opened branch offices in Montreal. That British manufacturers, so accustomed to rely on the merchant to handle their business in oversea markets, have failed to secure the share of the Canadian important trade to which they are entitled is partly due to the fact that so few of the British merchant houses have thought it worth their while to start offices in such centres as Montreal, Toronto and Winnipeg, to handle the trade between the two countries. The American manufacturer, on the other hand, has largely built up his trade in oversea markets by sending direct representatives from the works to study the conditions on the spot. With Canada at his door, so to speak (a night's journey only separating important manufacturing points in the United States from Montreal and Toronto), it is not surprising that the principal trading centres of Canada are overrun with the representatives of American manufacturers.

The trade of the United Kingdom with Canada has features which differentiate it in a marked sense from the export trade as commonly conducted between the United Kingdom and other self-governing Dominions and some foreign countries. The merchant in the latter instance occupies a predominant position and handles a very large proportion of the trade, although it is recognised that there has been for some time a growing tendency for manufacturers to establish direct relations with importers carrying on business in most oversea countries. In Canada, on the other hand, the merchant's presence is barely noticeable; direct trading between the wholesaler or retailer and the manufacturer is a marked feature and dominates the situation. Failure to appreciate this attitude has resulted in business passing the United Kingdom and going to the United States, so determined is the Canadian importer to trade only with the manufacturer. Even the commission agent or representative, resident and carrying on business in Canada (as distinct from a branch office of a manufacturer) comes in for a share of this dislike to trading with a go-between. This feeling of the Canadian buyer is very deeply rooted, quite as deeply, in fact, as is the custom or habit of the average United Kingdom manufacturer to rely on and employ commission agents and merchants for disposing of his productions in domestic trade and to utilise the services of the export houses for oversea trade. Accepting this view as correct, it will be understood how great are the difficulties underlying the situation and hampering the expansion of British trade with a market whose import trade has trebled itself in the short term of 11 years and which is as far as one can foresee only just beginning to give indications of its future value. It must be admitted that the majority of British manufacturers have not learned the essential details governing direct trade with an oversea customer, which it will take time to master, and to this fact may be traced the larger number of the criticisms directed by the Canadian against the British manufacturer, particularly criticisms having relation to circumstances attending the handling and forwarding of goods such as invoicing, packing, freighting, &c.

Attention may be called to certain factors which have repeatedly been brought to my notice as hampering many existing agents in their work on behalf of their principals in the United Kingdom.

The first is in regard to invoicing. Canadian money is in dollars and cents, but many British manufacturers apparently refuse to believe this and invoice their goods in English money to Canadian firms having little acquaintance with the intricacies of the British system. Not content with that, they will send perhaps four or five different invoices for different parts of the same appliance or machine, each one with different discounts and all in English money. The American manufacturer, on the other hand, invoices the whole machine or appliance in one sum, with one discount, in Canadian dollars and cents (which, it is true, is the same currency as his own). Another practice which is complained of is that adopted by many British manufacturers in altering their price or their discounts from time to time, simply notifying the change in the discount, 2½ per cent. or 5 per cent. up or down, as the case may be. The American manufacturer, on the other hand, fixes a price on many of his goods at the beginning of the year, and holds that price good for 12 months. It is, I am sure, only necessary to realise these striking differences between the methods of the manufacturers of the two countries to appreciate what the difference is in the work involved. When it is also realised that owing to the great expense of running an office and of living in Canada, clerks are few and far between in these agents' offices (the principals of many of them being their own invoice clerks, book-keepers, cashiers, as well as salesmen), the agent has directly brought home to him the extra amount of work involved in representing the average British firm. However great his inclination is to do this, it is gradually sapped and weakened owing to the time he has to spend in elucidating the problems and puzzles which the British manufacturer supplies him with but omits to remunerate him for. It is suggested that all British manufacturers should invariably provide invoices with one discount, and if they are unable to alter their practice of continually revising prices, at least to work out the revision themselves and supply the result in Canadian currency for their agent.

The second matter is the question of marking cases. It cannot be too strongly emphasised that the name of the Canadian town to which delivery is to be made, should be spelled out in full. It is not sufficient to indicate it by the first letter. To this matter I have drawn attention, as it has recently been repeatedly brought to my notice. The loss of a package is surely to be avoided, as well as the expense incurred in telegraphing and searching over large stretches of this Continent in order to find some two or three cases destined for, say, Calgary, some 2,000 miles from the landing ports. To send forward packages marked 

as was actually done some few months back, is asking for trouble.

I am inclined to believe that the practice of charging for packing cases adopted by United Kingdom firms is a mistake. The British manufacturer would be better advised to include the cost of the packing in the price of the article. He should also take care to avoid making the packing case unnecessarily heavy with thick sides as well as ends. For every part of the case which is even $\frac{1}{32}$ in. too thick the importer here has to pay so much additional freight, whether by weight or measurement, and it must add to the final cost of the article and thus retard the development of the trade.

It is pleasing to note that inquiries from the United Kingdom are steadily increasing in number, both from firms desiring to obtain suitable representatives and also from firms inquiring as to the conditions affecting the sale of their goods in different parts of the Dominion. United Kingdom manufacturers will materially assist in the Trade Commissioner's work if they will see that he is placed on their mailing list for catalogues, price lists, and discount sheets. These catalogues serve two purposes:—(1) A reference for Canadian importers, and (2) an effective advertisement for the United Kingdom manufacturer.

GENERAL MARKET FEATURES.

For the working of the Canadian market, several difficult problems present themselves which require to be overcome, if the distribution is to be adequately and economically carried out. The ribbon of territory forming the Canadian market is all one country, but may be divided into sections each of which has its own distinctive features—in the character of its inhabitants, their pursuits and their wants. The differences in these distinctive features require as much study as the differences in the conditions in the several European countries from east to west. The practice of many Canadian firms, based upon long experience, is to have branches established in at least four centres, for distributing purposes, in addition to Montreal. Some of these firms have gone so far as to establish branch factories in the west, having found it necessary to start these in order to hold their trade and, mainly, to save the long and expensive rail haulage from the extreme east of Canada. It is stated that experience has taught Canadian firms that to work a territory economically, it is wise to establish a separate branch in order to limit the distance to be covered by the traveller. This should not exceed an 18 hours' journey from wherever the branch is located. In accordance with this principle, many firms roughly divide the long ribbon of territory into the following distributing centres:—

1. Montreal—for the maritime provinces and about 80 miles west, to Cornwall.
2. Toronto—for the towns around Lake Ontario and the Niagara peninsula, to include Sault Ste Marie.
3. Winnipeg—for the western prairie, east and south to Fort William, west to a point about half way to Calgary.
4. Calgary—north to Edmonton, south along the Crow's Nest Railway to Nelson, west to the Rockies.
5. Vancouver—for British Columbia and Victoria, Vancouver Island.

The British merchant or manufacturer should realise that to place an agency with a Montreal firm without branch offices either east or west, as sole agent for the Dominion, can hardly result in the thorough distribution of his goods throughout this long, narrow ribbon of territory. It should also be borne in mind that even if the agent makes a tour of the Dominion once, or even twice, a year, he has to be absent for many weeks and incur very considerable expense, and it is doubtful whether the result is proportionate to the heavy expenses and loss of time involved.

The finding of a suitable agent is a very difficult problem, no matter how much care is taken. Where the article requires mainly salesmanship—by this is meant an article whose merits the average agent can speak of from literature or explanations supplied by the manufacturer—the task is a little simplified. Where, however, the article requires some technical knowledge on the part of the agent, the task of finding a suitable representative is made infinitely greater. To begin with, firms of manufacturers' agents with an established business are few in number, and are usually already provided with agencies of foreign manufacturers; they are, therefore, mostly barred from handling a British agency covering similar goods. Even when an agent is found who is suitable in

many ways, he will, in the majority of instances, be found to be quite unacquainted with the merits of the appliance or machine for which a market is to be developed. The British manufacturer is slow to recognise that his appliances and machines, unknown, or very little known, on the Canadian market, must require a good deal of missionary work to be undertaken, and heavy expense to be incurred, before they become known. When a British manufacturer determines seriously to develop this market for his products, he should be prepared to send a technically qualified assistant from his works to spend a year in the agent's office. The assistant might be paid partly by the home firm, and partly by the agent. At the end of some 12 or 18 months, the assistant having, on the one hand, thoroughly demonstrated the technical advantage of his firm's products to the agent, and, on the other hand, acquired information and experience of local conditions, unobtainable otherwise than on the spot, should, on his return, with the experience gained, prove of considerable value to his firm.

Another point to be remembered when endeavouring to introduce an appliance or machine of a technical character, or an article whose cost exceeds that of a similar article already on the market, is that Canada is an extremely expensive country to travel in—how costly, probably few firms in England appreciate. Now, it stands to reason that the agent will not incur the expense of the missionary work required to introduce such goods as are above described without sufficient incentive. It amounts to this, roughly, that either the British manufacturer must, the first year or two, pay for the pioneer work to be done, or, in the alternative, reduce the cost of the article desired to be introduced to a price equivalent to, or lower, than the competing article on the market, and leave the agent to go ahead, relying on his own ability to introduce and make a trade in the article.

ELECTRICAL ACCIDENTS IN 1912.

(*Concluded from page 75.*)

WHILST there has been a very great advance in the design of high-tension switchboards during the last few years, the same attention has not been given to the design of direct-current medium-pressure boards. These switchboards are commonly arranged so that it is impossible to do any work upon them without danger of making a short circuit. There is much room for improvement in this respect, not only in the relative arrangement of the conductors at different potentials, but as regards the conductors and the earthed metal framework which supports the slate or marble panels. Many of the short circuits due to men working on the live conductors have been between one conductor and the earthed framework. There is nothing impracticable in protecting the framework by slate or other suitable material and protecting bolt heads on the front of the panels in such a way as to overcome this danger, or in putting more divisions between conductors of opposite polarity, and the extra cost involved would be well repaid by the increased security against accident and breakdown. Some extra space would no doubt be required, but this again would be an advantage, as a common fault with these switchboards is that the apparatus and conductors are much too cramped together. Watt-hour meters in which the main current of the circuit passes through the instrument are not unfrequently found on switchboards. These instruments require periodical calibration or comparison with a standard instrument, often involving risky work at the back of the board in making the temporary connections for the standard and in reinstating, no provision having been made for the ready connection of the standard instrument. Some of the accidents from short circuits already referred to were due to this operation. Instruments having a current coil as a shunt to a resistance in the main circuit are to be preferred as tending to obviate the necessity for breaking and making main connections for purposes of calibration, with an additional advantage that the meters can be placed away from the switchboard where they are less liable to the influence of stray fields. In comparatively few stations are there provided any insulated spanners or special tools for use on live switchboards. Where any work has to be done, ordinary engine room tools are used with attendant risk of making short circuits.

Although my report, as usual, deals mainly with unsatisfactory conditions and dangerous apparatus which I have come across during my visits, I have also seen much that is excellent and which is very useful to point to as a standard in the less satisfactory places. In many cases the Regulations are well observed and precautions beyond those actually required have been adopted. In other instances, however, the Regulations have not been attended to, and engineers and others who should be familiar with the requirements have confessed to being totally unacquainted with them; others again seem to think that there is no need for them to take any steps to effect compliance until the matters have been pointed out to them by an inspector. Some also seem to take much trouble to work as near the border line as possible. Thus, new switchboards are erected with the bare minimum of space at the back, although there may have been several feet to spare at the front—a practice liable to lead to difficulties later on if any alterations or additions needing more space are required at the back. Others again fail to see that the Regulations are intended to provide for safety and are not merely arbitrary rules without a purpose. Thus, Reg. 17, which requires a certain minimum width of passage-way behind switchboards, is subject to exemption for low pressure. Some occupiers or their contractors, in putting up switchboards subject to this exemption, instead of providing some reasonable width of passage-way do not provide space at the back sufficient for ordinary convenience to say nothing of safety. In one case, a low-pressure three-phase board with iron floor plates front and back, had only 9 in. clear space behind, although there was room and to spare in front. In other cases, low-pressure switchboards are placed in inaccessible or dangerous positions, but are exempt from Reg. 25, which does not apply to low-pressure systems. In another case, also by a well-known firm, a number of 220-volt two-phase switch panels were placed in the pump room of a supply station over iron plating and without any protection. In other cases covers were provided, but constituted a trap. The switch and fuses were under the same metal cover. If a fuse should blow and require renewing, the metal cover would have had to be unscrewed and removed. The permanently live contacts of the switch were within ½ inch of the metal cover so that there would be great danger to the attendant of shock to earth should he allow the cover to touch the live conductors whilst removing it. Fortunately, such cases can be dealt with under Reg. 1, which provides for safety in general terms. That Exemption 1 is not intended to allow of unnecessarily dangerous conditions merely because the pressure happens to be below certain limits, is made quite clear in the Commissioner's Report on the Public Inquiry. The exemption as regards public supply stations was given merely because such stations are "generally well arranged and kept, but it does not exempt from the requirements of Regulation 1. The idea that where Exemption 1 applies, conductors and apparatus may be arranged totally regardless of danger, is entirely erroneous.

Transforming sub-stations are nearly always now constructed so as to be in accordance with the requirements. I found, however, one example of a new station which was very dangerous. The roof was only 4 ft. high, and there were bare high-tension fuse terminals totally unprotected close to the switch on the back wall. One of the high-tension accidents already referred to occurred in this sub-station. In another sub-station I found high-pressure grip fuses not protected by switches and having exposed live metal at each end, placed over a cement floor and no insulating stand or gloves provided.

I found during the year numerous examples of switches and switch-fuses, both in electrical stations and other works, not in accordance with the requirements of Regulation 3 (*c*), that is, that they were not so arranged that "the hand cannot inadvertently touch live metal." As I mentioned last year, several firms have taken up the manufacture of switch gear and other apparatus specially designed to meet the requirements and others are now doing so. Unfortunately there are firms who continue to advertise and sell apparatus that does not comply with the requirements, taking the view that it is none of their business where the apparatus is ultimately used, whether on factory premises or elsewhere.

Hand lamps which do not comply with the requirements are still to be found in use, and the readily contrived substitute for a properly constructed portable lamp, consisting of a lamp in an ordinary metal lampholder on flexible wires, is often used. There would be no objection to its use if the holder were earthed, which, however, is never the case, and it is, therefore, dangerous when used in places where the person handling it is not insulated from earth. Several of the fatal hand-lamp accidents during the last few years have been caused through the use of this makeshift

TABLE III.—ELECTRICAL FATALITIES REPORTED UNDER THE FACTORY ACTS IN 1912.

No.	Month.	District.	Voltage of system.	Voltage of circuit or probable voltage of shock.	System. A = Alternating, 1 = single-phase, 2 = two-phase, 3 = three-phase, D = direct.
1	Jan.	Dundee ...	630	630	A 1
2	Jan.	Glasgow ...	400	230	A 3
3	Feb.	Stockton ...	440	250	A 3
4	Feb.	Dublin ...	5,000	3,000	A 3
5	Feb.	Leeds ...	400	230	A 3
6	Mar.	N. London ...	10,500	6,000	A 3
7*	June	Newcastle ...	440	440	A 3
8	July	Edinburgh ...	2,000	1,150	A 3
9	July	Manchester	400	230	A 3
10	Aug.	Glasgow ...	440	250	A 3
11	Sept.	Sheffield ...	200	200	A 1
12	Sept.	Liverpool ...	220	220	D
13	Oct.	Glasgow ...	440	440	A 2
14	Oct.	Sheffield ...	500	290	A 3
15	Oct.	Derby ...	6,600	3,800	A 3
16	Oct.	Derby ...	6,600	3,800	A 3
17	Nov.	Manchester	6,600	3,800	A 3
18	Nov.	Wolver'hpton	460	460	D
19	Dec.	Newcastle ...	440	250	A 3

* Fall following shock.

arrangement. Several new and good patterns of safety type hand lamps have been introduced during the year. The construction of some of the safety type hand lamps now on the market is faulty, as they are not made to stand rough usage or use in hot places, such as engine rooms and boiler houses. Some of these hand lamps have metal guards so heavy and so insecurely attached to the body, that if they are dropped on the floor the guards will break away. The use of soft wood in the construction is also unsatisfactory, as it is liable to shrink and split from the heat of the lamp, and is particularly unfitted for use in hot places. Some of the best types have no wood in their construction, an insulating fire-resisting composition being used in place of it.

In an underground switch chamber not under the Acts, a man employed in cleaning was killed by contact with a live conductor. He had neglected to wear the rubber boots provided, and it was subsequently found that he had painted the soles of his feet with an insulating varnish, presumably thinking thereby to render himself immune from shock.

Of the above 18 fatalities directly due to electric shock, five were on high-pressure or extra-high-pressure alternating-current systems. Ten were on medium-pressure alternating systems; six of these were shock to earth on three-phase systems of which the pressure between phases was 440 volts or less, and as the neutral point was earthed in probably each case, the pressure received would not exceed 250 volts in any instance. One was from a 200-volt single-phase system. Of the two on direct-current systems, one was on a 460-volt three-wire system, but not having the middle wire earthed, and the other on a 220-volt two-wire system.

In only nine cases is it clear that any attempt was made to resuscitate the victim by means of artificial respiration. In several it was certainly not attempted. In the cases in which it was tried, the duration of the effort varied considerably. In one case it was kept up for two hours, in another for three-quarters of an hour, and in a third for 10 to 15 minutes, in each case with medical aid, whilst in a fourth it was continued until the arrival of a doctor, who pronounced the patient dead. In two further cases the patients were taken in ambulance wagons to the hospital, and in one of them only was the treatment continued during the journey. In two other cases the treatment was continued, apparently without medical aid, for half an hour, and in another for a few minutes only, as the patient "appeared to be dead."

Dr. Reginald Morton says:—There are only two fundamental facts that need be impressed upon the minds of everyone. The first is that death from electrical shock is only an apparent death at first; and, secondly, whatever the conditions or severity of the accident, there is practically always a time, varying from a few minutes upwards, during which it is possible to resuscitate the victim by artificial respiration if resorted to at once. So important is it to commence artificial respiration quickly, that it is the first duty of the bystander to see to this before everything else. He must not leave the victim to summon medical aid—it may be too late by the time the doctor arrives—but he should send for medical assistance if there is anyone else present.

Artificial respiration must be persevered with for at least two hours, or until the patient revives; in many cases it may be only a few minutes. After return to consciousness complete rest is essential for a day or two, and under no circumstances must the man be allowed to return to work at once, as he may wish to do if the shock has been a light one. With the prompt application of first aid practically every victim can be revived, and of these nearly all will make a complete and permanent recovery, provided they were previously in a normal state of health.

Instructions for the treatment of persons suffering from electric shock are required by the Regulations to be posted in every electrical station and factory using electrical energy at pressures above low pressure. For many years before Regulations came into force, thanks to the efforts of the technical Press, particularly the ELECTRICAL REVIEW, electrical station engineers were generally fairly well acquainted with the measures to be adopted; but, in other works, there may be no one who has even read the placard. To delay reading the instructions until an accident has occurred may render any attempt at resuscitation useless, as the patient may die in the interval, or the subsequent efforts at resuscitation may be so inefficiently carried out as to be futile. In all electrical stations and works where electrical energy is much used there should be persons who have been taught and practically drilled in methods of artificial respiration. It is most important, as pointed out by Dr. Morton, that no time be lost in getting to work after the accident, and there should be no cessation of the efforts for at least two hours. Owing to the comparative rarity of electric shock accidents, very few medical men can have ever had actual experience in their treatment, and it is quite certain that some at any rate do not realise the importance of perseverance in artificial respiration. In a number of fatal cases which I have investigated, the persons present have started artificial respiration and a doctor has been sent for, and on arrival has pronounced the patient dead, and has gone away all within half an hour of the accident. A case of this kind was cited by a witness at the public inquiry into the Regulations a few years ago where, on the doctor having pronounced the victim dead, the men returned to the patient and continued the artificial respiration and succeeded in bringing him round. In a recent case of death from a low-voltage shock, the doctor who was called in is reported as having said at the inquest that attempts to restore animation immediately after the accident would have been useless, as he was sure death was almost instantaneous. Whether the doctors are generally correct in pronouncing life extinct so soon after the accident is not for a layman to judge, but in view of Dr. Morton's letter, it does appear that some of the cases may have been given up too soon.

PROCEEDINGS OF INSTITUTIONS.

Copper and Aluminium Cables for Mining Work.

By BURKEWOOD WELBOURN, M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF MINING ENGINEERS, *June 5th*, 1913.)

THERE is no inherent electrical reason why insulated aluminium conductors should not be used for all purposes and at all working pressures. As regards the use of copper or aluminium, every case should be settled on its merits.

The world's annual production of copper is about 1,004,485 tons, and of aluminium approximately 60,000 tons. For electrical work only about 15 per cent., or, say, 10,000 tons, of all the aluminium produced is used. Further plants are now being constructed, which will increase by 50 per cent. the present output of aluminium within the next two or three years; a reduction in the selling price should follow, and result in a considerable increase in its use for electrical work.

Electrolytic copper-wire bars contain about 0·2 per cent. of impurities, and should comply with the requirements of the Engineering Standards Committee of March, 1910; but there is no E.S. Committee's standard for aluminium. Aluminium bars usually contain 0·5 to 0·7 per cent. of impurities (chiefly silicon and iron), and these should never exceed 0·71 per cent., at which figure the conductivity of hard-drawn aluminium is 60 per cent. when compared with the British standard for hard-drawn copper at 60° F.; with 0·5 per cent. of impurities the conductivity will be as high as 61·7 per cent. If the impurities do not exceed 0·75 per cent., as can invariably be arranged, bare aluminium wires can be used in the United Kingdom in any situation in which copper wires can be employed.

For lines near coke ovens, aluminium should always be used, as it resists the action of sulphur dioxide products, whereas copper will not do so.

If equal sections of copper and aluminium are tested under equal conditions, it will be found that an aluminium conductor will carry 60 per cent. of the current that a copper conductor will carry with the same loss of energy. Conversely, the cross-section of an aluminium conductor must be 1·666 times that of a copper conductor if it is to carry the same current with equal drop of pressure.

For a given current-carrying capacity, theoretically only half the weight of aluminium is required as compared with copper, and in practice this is also nearly true.

The coefficient of linear expansion per degree Fahrenheit is 40 per cent. greater for aluminium than for copper.

Aluminium for overhead lines should always be cold-rolled, despite the greater expense. Cold rolling, coupled with improved manufacturing processes in England, has increased the breaking-strain of aluminium by 10 per cent. over that obtained only three years ago. Individual wires for overhead lines should be specified to comply, after stranding, with the tests given in Table I, without interfering with the electrical conductivity:—

TABLE I.—SUGGESTED TESTS FOR HARD-DRAWN ALUMINIUM CONDUCTORS.

Standard wire gauge.	Diameter of wire.	Breaking-strain.	Extension on a 5-in. length.	Wrapping test.
	Inches.	Tons per square inch.	Per cent.	
4	0·232	11·00	3·00	Three times round its own diameter on and three times off.
6	0·192	12·00	3·00	
8	0·160	13·00	3·00	
10	0·128	13·50	3·00	
12	0·104	14·00	2·50	
14	0·080	14·50	2·50	
16	0·064	14·75	2·50	

The breaking-strains agree very closely with the equation:—

$$T = 16{\cdot}5 - 24\,D,$$

where

T = Tensile strength in tons per sq. in., and

D = Diameter of wire in inches.

There appears to be no case in the United Kingdom in which aluminium cables have been used for shaft or in-bye work in a mine. In mines cables are almost invariably insulated with impregnated paper, or bitumen, and protected with wire armour and compounded tapes or jute.

The diameter of aluminium cables is greater than that of the equivalent copper cables, hence the cost of protecting an aluminium cable exceeds that of a copper cable. Investigation of cables protected with jute string shows that the jute opens at bends in the cable and allows the water of the mine, often corrosive, to have access to the armour. The writer is of opinion that compounded hessian tapes afford much more certain protection than jute string. The chief corrosive agents to be guarded against in vulcanised-bitumen cables are (1) caustic soda, due to the electrolysis of salt

on the occurrence of a leakage of direct current; (2) lime in concrete and mortar; and (3) alkaline waters, due to calcium carbonate.

There are very few corrosive agents which will attack lead. Those which do so form a protective coating on the lead, if not subjected to external electrolysis. There have been a few cases of corrosion of lead sheathing in mines, but expert examination always reveals (1) that the corrosion is the result of chemical action aided by electrolysis, and not of chemical action alone; (2) that corrosion is almost confined to direct-current circuits only; or (3) that the lead has not been made continuous and connected to earth. Corrosion of the lead sheathing due to electrolysis cannot occur on alternating or direct-current circuits if the Home Office requirements for the continuity and earthing of the lead and armour on cables are adhered to. The writer advocates the very highest standard of cable work in mines, whether copper or aluminium conductors are used, and indicates his personal preference for paper-insulated lead-sheathed cables.

All three-core lead-sheathed single and double-wire armoured cables, and all vulcanised-bitumen double-wire armoured cables built to the British Engineering Standards Committee's table of March, 1910, for all pressures up to and including 3,000 volts, and of all sections of copper (and equivalent aluminium) conductors from 0·025 to 0·30 sq. in. area, comply with the Home Office Rule 12 (*e*) (iv).

Tables have been drawn up here which may prove useful in deciding what type of cable shall be installed in any given case. The first table (II) compares directly the relative prices of low- or medium-pressure three-core copper conductor shaft-cables, double-wire armoured, taped, and compounded; (*a*) paper-insulated lead-covered, and (*b*) vulcanised-bitumen insulated.

TABLE II.

Area. Sq. in.	(*a*) Paper-insulated.	(*b*) Bitumen-insulated.
0·05	1·00	1·19
0·10	1·00	1·15
0·25	1·00	1·13

TABLE III.

Description.	Sectional area, in sq. in.		
	0·05	0·10	0·20
(*a*) Paper insulated with sector cores, lead-sheathed and single-wire armoured	1·00	1·00	1·00
(*b*) Paper insulated with sector cores, vulcanised-bitumen sheathed and single-wire armoured ...	1·10	1·08	1·06
(*c*) Vulcanised-bitumen insulated, with round cores and single-wire armoured	1·18	1·15	1·12
*(*d*) Paper insulated with sector cores, vulcanised-bitumen sheathed and double-wire armoured "leadless" cables ...	1·40	1·31	1·22
*(*e*) Vulcanised-bitumen insulated, with round cores and double-wire armoured	1·48	1·38	1·29

* These cables could also be used for shaft-work.

Table III gives the relative prices for various low or medium-pressure three-core cables with copper conductors for in-bye use, and shows the considerable saving in first cost of the lead-sheathed cable as compared with any form of bitumen cable.

The Home Office memorandum on Rule 12 clearly recommends that double-wire armour should be employed even on in-bye cables when no lead sheath is used. If this recommendation be followed the saving in first cost between items (*a*) and (*d*) or (*a*) and (*e*) is remarkable.

The most important cases in which aluminium cables have been used in this country are as follows:—

Manchester Corporation Electricity Department, over 11,000 yards of single-core cable, chiefly of 1·66 sq. in. area.

Bolton Corporation Electricity Department, 1,440 yards of single-core 1·66 sq. in. cable.

Metropolitan Electric Supply Co., Ltd., London, about 6,000 yards of 0·83 sq. in. concentric and triple-concentric. All the above are paper-insulated lead-sheathed.

The writer has seen a list of places in which over 800 miles of cable are employed at voltages varying from 240 to 60,000 (single-phase).

At the time of writing this paper (March, 1913) the market values prevailing have been used in working out the comparative prices of insulated cables as follows:—

	£	s.	d.
Copper (electrolytic wire bars), per ton of 2,240 lb.	69	5	0
Aluminium do. do. do.	90	10	0

For three-phase work at low and medium pressures, taking, for example, a copper cable of 0·1 sq. in. (aluminium 0·166 sq. in.), the aluminium cable is the cheaper:—

(*a*) In plain lead-sheathed cables whenever aluminium wire bars are less than £22 per ton above the price of copper bars.

(*b*) In single-wire armoured cables whenever aluminium wire bars are less than £10 per ton above the price of copper bars.

(*c*) In double-wire armoured cables whenever aluminium wire bars are lower in price than copper bars.

For continuous-current work, at low and medium pressures, a comparison between a 0·30 sq. in. copper single-conductor paper-insulated lead-sheathed cable and the equivalent 0·50 sq. in. aluminium cable, both being built to comply with the Home Office rules, shows that the aluminium cable is the cheaper:—

(*a*) In plain lead-sheathed cables whenever aluminium wire bars are less than £42 per ton above the price of copper bars.

(*b*) In single-wire armoured cables whenever aluminium wire bars are £22 or less per ton above the price of copper bars.

(*c*) In double-wire armoured cables whenever aluminium wire bars are £10 or less per ton above copper bars.

The latter comparison holds good when the conductors are insulated with bitumen instead of paper.

There are installations where economies can be effected by using unarmoured aluminium cables on the surface works only, especially when the generating station or sub-station is situated at any considerable distance from the shaft. With larger sizes of unarmoured continuous-current cables, the saving is greater, and unarmoured concentric and triple-concentric aluminium cables for pressures up to 650 volts usually show a considerable saving over the equivalent copper cables. One such case came under notice this year, where a triple-concentric aluminium cable showed a saving of 20 per cent. over the corresponding copper cable.

For 3,000 volts three-phase, in the case of a 0·20 sq. in. paper-insulated three-core copper conductor lead-sheathed and double-wire armoured cable, the aluminium cable cannot compete either in price or in weight.

The first cost of overhead transmission lines of stranded aluminium conductors of 0·10 sq. in. sectional area and upwards, with spans up to 400 ft. (the maximum usually employed in the United Kingdom), is less than for lines of copper conductors. A comparison of the cost of a 6,600-volt three-phase 25-cycle line to carry 1,000 KW. for 10 miles under British conditions, constructed of copper and aluminium, shows an approximate saving of 16·5 per cent. in favour of aluminium. In three definite cases in this country in which *bonâ fide* alternative tenders were given for lines with both aluminium and copper conductors, the tender for aluminium was accepted in each case.

Experience in North America has shown that there is much less trouble with aluminium than with copper from ice and snow collecting on the conductors.

For jointing insulated cables, the author cannot recommend either cast-aluminium joints or autogenous welding, owing to the effect of the heat on the insulation. But he can confidently recommend mechanical joints of the type illustrated in fig. 1.

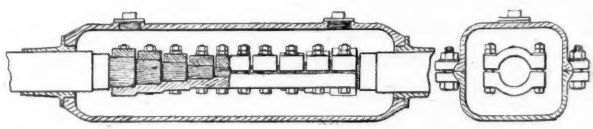


FIG. 1.

Copper joints can be easily made on overhead lines by means of flexible copper braid bound and soldered to the joint; this system has been patented by Mr. Chas. Vernier.

There are various ways of jointing aluminium conductors on overhead lines. Up to 0·25 sq. in. welded joints can be made. Another way of jointing large conductors is by means of the type of clamp-joint shown in fig. 1. These joints cannot be used under stress. A torsion sleeve-joint may be employed for jointing conductors up to about 0·30 sq. in., under strain, and a specially-designed joint for use under stress was employed on Messrs. Newton Chambers & Co.'s 1·4 sq. in. line.

Frequently on overhead lines it is necessary to employ lead-sheathed paper-insulated cables, supported by hangers attached to a steel suspending cable. With these, in the past, there has been much trouble, owing to the cracking of the lead sheath. The troubles have been eliminated by the use of the method of suspension covered by Mr. C. E. Elder's patent, and by the addition of 3 per cent. of tin to the lead sheath. The system consists of very short chrome-leather supporting hangers, placed 12 in. apart, and fastened to a stranded steel suspending cable in such a way that they have no longitudinal movement. At every tenth hanger, a sherardized flat-steel spring is sprung on the hanger for clamping it to the cable and so preventing any longitudinal movement of the cable relative to the hanger. In special cases, every hanger may be clamped to the cable. Clean, commercially pure aluminium scrap, as obtained from cables or from overhead lines, can readily be sold at about £22 per ton below the market price of aluminium-wire bars; the price of clean electrolytic copper scrap is about £6 per ton below the price of wire bars.

Aluminium is coming increasingly into favour. The initial difficulties have been overcome, and it can be safely used as a conductor on an equal footing with copper. For mining work in the United Kingdom, at the present prices of copper and aluminium, insulated cables with copper conductors and for all pressures are the cheaper, while, for overhead lines, aluminium conductors are the cheaper. Paper-insulated lead-sheathed cables are cheaper than bitumen-insulated cables, whether the conductors be of copper or of aluminium.

Association of Consulting Engineers.

THE annual general meeting of the Association was held at the Institution of Electrical Engineers, London, on Monday, June 30th, 1913, MR. G. MIDGLEY TAYLOR (of Messrs. John Taylor & Sons) presiding.

The CHAIRMAN said that in accordance with the rules, a ballot had been held to decide the members of the committee who should retire, and Mr. W. T. Douglass, Mr. Baldwin Latham, Mr. E. L. Mansergh, Mr. E. H. Stevenson (London), Mr. J. H. Harrison (Middlesbrough), and Mr. T. L. Miller (Liverpool) were drawn out. The following had been elected on the committee to take the places of the members resigning :—Prof. David Capper, Mr. E. M. Eaton, Mr. Robert Hammond, Mr. A. J. Martin, Mr. H. S. Childe (of Wakefield), and Mr. W. L. Spence (of Glasgow). There was this year meeting at Ghent, from July 17th to 22nd, a Congress of Consulting Engineers in connection with the Ghent exhibition, when the bodies represented would include the Associations of Consulting Engineers of France, Copenhagen, Berlin, California, New York, Utrecht, Switzerland, and Zurich. He hoped their hon. treasurer, Mr. Lowcock, would be able to attend, and represent the London body. He thought this meeting in Ghent this year justified their existence, and that in view of what was being done in other countries, the time had arrived when they should have the support of every genuine and *bonâ fide* consulting engineer in this country. There had been a very large demand for the booklet setting forth the professional rules and practice of members of the Association, which, to his own knowledge, had been of material assistance to various members of this Association when dealing with the public bodies by whom they were employed in this country, and on more than one occasion the booklet had enabled a consulting engineer to have his own way with regard to his professional work and his fees. There was a balance in hand of £16 16s. 11d. at December 31st, 1912. At the present time there was £110 7s. 10d. He proposed the adoption of the report, which was seconded by

MR. H. PERCY BOULNOIS, who said 80 members were subscribers, and he had no doubt that in process of time they would quadruple the number. There were many men still standing aloof, but he hoped they would be able to show them that they had better belong to that Association. If it had not been for Mr. A. H. Dykes the Association must have failed.

The motion for the adoption of the report was carried unanimously ; Mr. C. F. Mendham and Mr. Arthur Preece were then proposed and appointed as auditors.

MR. J. S. ALFORD proposed an amendment of Rule 2, which at present stated that members of the Association of Consulting Engineers must be Corporate Members of the Institution of Civil Engineers, or full members of the Institution of Electrical or Mechanical Engineers. He desired to add the words "or the Institution of Civil Engineers of Ireland." Mr. Arthur J. Martin seconded the proposition, which was carried unanimously, subject to confirmation at a special meeting called for that purpose.

Votes of thanks to Mr. Dykes, and to the Institution of Electrical Engineers for the use of its rooms, were then passed.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"LANDLORD" writes :—"A tenant of mine recently received from the Electric Lighting Co. a letter to the following effect :—

"'Owing to the very small consumption at your premises, we propose to remove the meter and fittings after the expiration of seven days, as it is unprofitable for us to allow same to remain.

"'If you are likely to be increasing the consumption to any extent, or if you are agreeable to pay a rental for the meter of 5s. half-yearly in advance, kindly advise us, when we shall be pleased to reconsider the matter.'

"The tenant had signed an agreement which contained the following provision :—

"'In consideration of the Electricity Supply Co., Ltd., wiring eight lighting points in the premises known as —— —— which are now in my possession, and supplying plain drop fittings, I hereby agree to pay towards the expense of installing same the sum of 2s. 6d. (two shillings and sixpence) per point for such eight points. The said wiring and fitting to remain the sole property of the supply company.

"'I also agree during my tenancy or occupation of the said premises to take a constant supply of electric current for the lamps referred to below by slot meter, and upon the conditions herein set forth under the heading of general conditions, and I further agree to use no other illuminant in the rooms where electric light is installed.' There followed particulars of fittings."

* * * It is difficult to say what is involved in an undertaking to "take a constant supply of electric current . . . by slot meter." Presumably it is something quite distinct from an undertaking to consume so many units. So long as the consumer uses the current which passes through the slot meter, and no other, for the purposes of lighting, it would seem that the company can have no possible right to complain. In any event, it is impossible to conceive what legal basis there is for the notice contained in the letter which forms part of the query.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

BRITISH GUIANA.—The Government of British Guiana have passed an Ordnance giving effect to the terms of the Canada-West Indies Treaty for the inauguration of preferential Customs treatment of goods from Great Britain or Canada on importation into that Colony. The following are the new rates of duty which are of interest to readers of the ELECTRICAL REVIEW :—

	British preferential tariff.	General tariff.
Electric machinery not admitted free of duty	12 % ad val.	15 % ad val.
Electrical dental appliances of all kinds	12 „	15 „
Wire	12 „	15 „

The following will be admitted free of duty :—Machine belting ; machines or sets of machines to be worked by steam or other power, or which before being brought into use require to be fixed with reference to other moving parts, and which are intended for electric lighting and power plant ; accessories for machinery and other appliances or apparatus which are intended for use in electric lighting and for railway power plant—viz., wire for use in electric street lighting and locomotion, motors and their parts, controllers and their parts, rheostats and rails and their appendages ; for use in connection with electric lighting when imported by the Mayor and Town Council of Georgetown or New Amsterdam for lighting any street or place belonging to them or subject to their control, viz., implements ; steam boilers of every description and steam boiler plates, fittings, mountings, tubes and lagging ; telegraph instruments and other materials imported by telegraph companies and necessary for the construction and use of their works, offices and stations in the Colony ; telegraph forms, telephones and materials necessary for the construction of telephones ; all materials for use in railways or other special works which, in the opinion of the Governor in Council, may be useful in the development of the resources of the Colony.

WEST INDIES.—In accordance with the terms of the Canada-West Indies Agreement for the granting of preferential treatment to British and Canadian goods on importation into the West Indian Islands, provisions have been laid down in some of the Colonies requiring the production of certificates of origin as proof of the British origin of goods for which a preferential duty is claimed.

All articles entitled to preference shall be accompanied by a certificate of origin in the form prescribed.

Certificates of origin, in order to be valid, must be attested to in British countries before a Collector or other principal Officer of Customs or a Justice of the Peace, and in other countries before a British or other Consul, notary public or other official authorised to administer oaths, and they must bear the autograph signature of the authority issuing the same, together with the seal of office, if any. No certificate shall be valid after the expiry of six months from the date of its issue.

Inasmuch as it is possible that articles entitled to preference may occasionally be landed before the arrival of the certificates of origin relating to the same, it shall be competent for the Customs authorities to authorise the delivery of such articles at the preferential rates of duty on the security of the deposit equal in amount to the difference in duty between the preferential and general rates, or on bond being given for such amount for the due production of the necessary certificates within a prescribed period, provided that a general bond may be entered into to cover a series of transactions, and in a penalty suitable to the extent of such transactions. Deposits made under the provisions of this paragraph shall be carried to account under the appropriate head of revenue at the end of a week after the expiration of the time allowed for the production of the certificatss of origin.

When goods accompanied by certificates of origin are not in conformity with the descriptions borne on the certificates, by reason of discrepancies as regards the marks or numbers of the packages, or the kind, quantity or value of the goods, they shall not be entitled to preferential treatment unless the Customs authorities at the port of destination are satisfied as to the origin of the goods, and that the differences are solely due to error.

Goods certified for entry under the preferential tariff shall be packed separately from other goods. The packages, however, may be enclosed with other goods, provided the certificate of origin is endorsed accordingly.

In order to obtain admission at the preferential rates of duty, British goods shall be imported direct from the United Kingdom.

The Canada-West Indies agreement came into force on June 2nd of this year, and the West Indian Governments which are parties to the agreement are as follows : Trinidad, British Guiana, Barbados, St. Lucia, St. Vincent, Antigua, St. Kitts, Dominica and Montserrat.

The British Fire Prevention Committee.—Electro-glazing by the LUXFER PRISM SYNDICATE, LTD., has been classified as affording "partial protection" Class A on a 1½-hour test at temperatures exceeding 1 500° F., followed by the application of water, for panels of 2 ft. × 2 ft. Impending tests for the summer season include a reinforced concrete floor, material suitable for light fire-resisting partitions and several fire-resisting doors.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

14,994. "Automatic electric switches governing dual-rate energy meters." H. H. PERRY. June 30th.

15,014. "Electrical heating units and resistance coils and method of manufacturing the same." L. W. CAMPBELL. (Convention date, November 13th, 1912, Australia.) June 30th. (Complete.)

15,040. "Incandescent lighting." J. T. SIBLEY. June 30th.

15,046. "Metal vapour arc lamps." DEUTSCHE GASGLUHLICHT AKT. GES. (Auerges.) (Convention date, February 4th, 1913, Germany.) June 30th. (Complete.)

15,060. "Contact relay devices for use in connection with electric circuits." MASCHINENFABRIK OERLIKON. (Convention date, March 7th, 1913, Switzerland.) June 30th. (Complete.)

15,061. "Voltage regulator for electrical machines." MASCHINENFABRIK OERLIKON. (Convention date, April 14th, 1913, Germany.) June 30th. (Complete.)

15,062. "Switch and like mechanism." MASCHINENFABRIK OERLIKON. (Convention date, May 20th, 1913, Switzerland.) June 30th. (Complete.)

15,067. "Resistance material for electrical rheostats and method of manufacturing same." N. HARVEY. (Convention date, July 8th, 1912, Australia.) June 30th. (Complete.)

15,074. "Lighting fixtures." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) June 30th.

15,086. "Connections for electric tariff meters." C. G. LUNDGREN. June 30th. (Complete.)

15,088. "Electrically-heated utensils." C. E. HUNTER and C. O. BASTIAN. June 30th.

15,097. "Electric telegraph receiving apparatus of the selective type." W. J. LYONS. (Addition to 10,911, 1912.) June 30th. (Complete.)

15,123. "Ships' telegraphs and the like." T. L. KNIGHT. July 1st. (Complete.)

15,133. "Casing for containing electric wires." A. BARBER and F. H. THORNTON. July 1st.

15,148. "Dynamo-electric motors." SIEMENS BROS. DYNAMO WORKS, LTD., C. A. B. D. KOETTGEN and E. O. KIEFFER. July 1st.

15,149. "Change-over arrangements for electric supply or control systems." SIEMENS BROS. DYNAMO WORKS, LTD., F. LYDALL and C. E. FAIRBURN. July 1st. (Complete.)

15,164. "Methods for the construction of contact sets for the bank contacts of selectors." SIEMENS & HALSKE AKT. GES. (Convention date, July 4th, 1912, Germany.) July 1st. (Complete.)

15,175. "Sound-transmitting devices for talking motion-picture apparatus." W. G. HAMMACK. July 1st. (Complete.)

15,179. "Telephone relays." J. SCHIESSLER. (Convention date, July 15th, 1912, Austria.) July 1st. (Complete.)

15,199. "Systems of ship propulsion." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) July 1st.

15,218. "Electrically-operated drill of the percussion type." T. F. WALL. July 2nd.

15,235. "Union joints and couplings for electrical and other accessories." J. N. MOLLETT. July 2nd.

15,251. "Electric relay systems and apparatus therefor." A. W. HARRIS. July 2nd.

15,259. "Electric alarm for preventing the unauthorised opening of locks." O. SCHUMANN. (Convention date, August 5th, 1912, Germany.) July 2nd. (Complete.)

15,274. "Starting systems for internal-combustion engines and the like." H. LEITNER. July 2nd.

15,283. "Method of and means for determining the electrical characteristics of high frequency oscillation circuits." E. D. CARDEN. July 2nd.

15,284. "Charging and discharging electrical condensers or the like." W. J. MELLERSH-JACKSON. (Signal G.m.b.H., Germany.) July 2nd. (Complete.)

15,286. "Joining or bonding the junctions of metallic sheathing or armouring of electric conductors." L. SUNDERLAND. (Addition to 22,550, 1911.) July 2nd.

15,297. "Manufacture of electric incandescent lamps." F. SIMPSON. July 2nd.

15,318. "Electric lampholders or similar coupling members." G. ST. J. DAY. July 3rd.

15,327. "Lead accumulators." G. C. DYMOND. (Marquise des Ligneris née Charlotte Marie Berthe Tailhandier du Plaix, France.) July 3rd. (Complete.)

15,334. "Process and arrangement for suspending electric motors or the like permitting of absorbing all the vibrations." F. S. BOERRIES. July 3rd. (Complete.)

15,343. "Ignition generators." B. LAWRENCE. July 3rd.

15,348. "Electrically-illuminated letters." H. BEY. July 3rd.

15,360. "Process and device for the production of electric glow lamp bulbs with reflector." DEUTSCHE GASGLUHLICHT AKT. GES. (Auerges). (Convention date, November 16th, 1912, Germany.) July 3rd. (Complete.)

15,377. "Apparatus for registering telephone calls." J. J. ROWE. July 3rd.

15,379. "Furnaces for gaseous reactions at high temperatures." R. P. PICTET. July 3rd.

15,389. "Flash lamps." W. BALE and L. H. HOPKINS. July 3rd.

15,392. "Vapour electric devices." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) July 3rd.

15,411. "Boxes for holding accumulators and battery cells." C. H. WORSNOP. July 4th.

15,423. "Electrical lighting and starting mechanism for automobile vehicles." F. W. LANCHESTER. July 4th.

15,457. "Transmission of wireless signals." T. T. BAKER and GALLETTI'S WIRELESS TELEGRAPH AND TELEPHONE Co., LTD. July 4th.

15,463. "Galvanic cell." P. BURGER. (Convention date, July 6th, 1912, Germany.) July 4th. (Complete.)

15,485. "Telephone systems." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) July 4th.

15,502. "Series-connected electric consuming devices." R. FRANZ. (Convention date, July 4th, 1912, Germany.) July 4th. (Complete.)

15,516. "Means of using auxiliary petrol-electric supply for electric rail cars, trackless trolley vehicles, and the like." W. A. STEVENS. July 5th.

15,523. "Polyphase alternating-current motors and generators." CROMPTON AND Co., LTD., and H. BURGE. July 5th. (Complete.)

15,550. "Protective devices for electric distribution systems." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) July 5th.

15,556. "Ships' telegraphs and like apparatus." G. K. B. ELPHINSTONE. July 5th.

15,561. "Telegraphy." R. LOPEZ and CREED, BILLE & Co., LTD. July 5th.

15,566. "Radial selector switches." STERLING TELEPHONE AND ELECTRIC Co., LTD., and W. B. ALLCOCK. July 5th. (Complete.)

15,568. "Process and apparatus for making mica sheets." MEIROWSKY & Co, AKT. GES. (Convention date, July 22nd, 1912, Germany.) July 5th. (Complete.)

15,569. "Holders for electric incandescent lamps and the like." E. H. B. HUGHES. July 5th.

15,571. "Controlling means for electric motors." OTIS ELEVATOR Co., LTD. (Otis Elevator Co., Inc., United States.) July 5th. (Complete.)

15,579. "Automatic telephone exchanges." F. N. REEVES and A. E. LUNDELL. (Convention date, July 5th, 1912, United States.) July 5th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

ROTARY ANNULAR MULTIPOLAR MAGNETIC SEPARATORS. Maschinenbau-Anstalt Humboldt. 9,147. April 18th. (April 19th, 1911.)

SWITCHBOARD CONNECTING CORDS AND THE LIKE. P. P. Craven. 11,306. May 13th. (Cognate applications, 13,098 and 17,110, 1912.)

METHOD OF AND APPARATUS FOR TELEPHONICALLY ORDERING CABS, MESSENGERS AND THE LIKE. A. Hinzpeter. 13,207. June 12th. (Convention date not granted.)

TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 13,970. June 15th.

TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 13,971. June 15th.

SIGNALLING SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 13,972. June 15th.

TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 13,973. June 15th.

TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 13,974. June 15th.

TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 13,975. June 15th.

DASH-POT DEVICES APPLICABLE TO ELECTRIC CIRCUIT-BREAKERS AND OTHER APPARATUS. W. A. Harriman and A. Reyrolle & Co. 13,997. June 15th.

ELECTRIC WELDING. A. L. Johnson. 14,143. June 17th.

LIGHT REFRACTOR OR DIFFUSER. F. G. Brettell (Martenson). 14,192. June 18th.

MINERS' ELECTRICAL SAFETY LAMPS. W. Thomson and J. H. Rothwell. 14,202. June 18th.

LIGHT-PROJECTING APPARATUS FOR ATTACHMENT TO SMALL ARMS. Waffen-Technische-Ges. "Wespi." 14,269. June 18th.

ELECTRIC SWITCHES. H. Leitner. 14,270. June 18th.

TELEPHONE SUB-STATION SWITCHING SYSTEMS. W. Aitken. 14,317. June 19th.

MECHANISM FOR DRIVING ROTARY MAGNETOS ON INTERNAL-COMBUSTION ENGINES TO FACILITATE STARTING. B. Lawrence. 14,324. June 19th. (Cognate application, 21,582, 1912.)

SHIPS' COMPASSES. L. F. Fuchs. 41,339. June 19th.

CONTROL AND USE OF SERIES-WOUND DYNAMO-ELECTRIC MACHINES. H. F. Haworth and the Thomas Transmission, Ltd. 14,396. June 20th.

ELECTRO-MAGNETIC RELAYS. Siemens Bros. & Co., Ltd., and W. H. Grinsted. 14,564. June 21st.

ELECTRO-MAGNETIC MEASURING INSTRUMENTS. W. J. Davis and C. E. Hunter. 14,576. June 21st.

INCANDESCENT LAMPS WITH DRAWN-METAL WIRE FILAMENTS. K. Farkas. 14,655. June 22nd. (June 23rd, 1911.)

SUBSCRIBERS' STATIONS IN AUTOMATIC TELEPHONE SYSTEMS. Zivnostenska Banka v. Prazo (Firm of). 16,374. July 12th. (July 12th, 1911.)

APPARATUS FOR FIRING OR EXPLODING FLASH-LIGHTS FOR PHOTOGRAPHIC OR OTHER PURPOSES. W. H. Balfour. 16,794. July 18th.

MEANS FOR AND METHODS OF CLEARING FAULTS ON ALTERNATING-CURRENT SYSTEMS." A. M. Taylor. 16,830. July 19th.

HEAT TREATMENT OF METAL BODIES. J. H. Barker and Birmingham Metal and Munitions Co. 17,756. July 31st.

ELECTRICAL MASSAGE DEVICE. W. Goy. 18,271. August 8th.

ELECTRIC LIGHTING AND IGNITION APPARATUS OF MOTOR-VEHICLES AND THE LIKE. B. Brooks and W. Holt. 18,764. August 16th.

MAGNETO-IGNITION APPARATUS. Hartmann & Braun Akt. Ges. 19,913. August 31st. (August 31st, 1911.)

ELECTRIC RESISTANCE GRIDS. Electric and Ordnance Accessories Co. and W. G. H. Cox. 20,252. September 5th.

TWO-RATE ELECTRICITY METERS. Landis & Gyr (Firm of). 22,592. October 4th. (October 6th, 1911; Addition to 1,010, 1912.)

PORTABLE APPARATUS FOR USE IN CONNECTION WITH AN ORDINARY BATH FOR THE APPLICATION OF ELECTRICITY TO THE HUMAN BODY. H. S. Turner. 22,807. October 7th.

PROCESS FOR THE MANUFACTURE OF HEAT-REFRACTORY ARTICLES FROM TANTALUM. Siemens & Halske Akt.-Ges. 23,050. October 9th. (October 21st, 1911.)

MANUFACTURE OF MICA PLATES FOR ELECTRICAL RESISTANCES AND THE LIKE. C. Fischer. 23,869. October 18th.

BRUSHES OR COLLECTORS FOR ELECTRICAL MACHINES. W. E. Lake. (Soc. Anon. le Carbone.) 24,343. October 24th.

ELECTRICITY METER. L. Scholler. 24,954. October 31st. (April 30th, 1912.)

ELECTRIC TIME SWITCHES. W. Huttmann and C. Haberl. 25,787. November 9th.

DEVICES FOR THE AUTOMATIC REGULATION OF ELECTRIC MACHINES. R. Bosch (Firm of). 27,961. December 4th. (November 15th, 1912.)

ADVERTISING AND DISPLAY CONTRIVANCES. W. H. Ell and J. Miller. 28,228. December 6th.

APPARATUS FOR HEATING LIQUIDS BY ELECTRICITY. J. von Hentzel. 28,359. December 9th.

ELECTROMAGNETIC RELAYS. Siemens Bros. & Co., Ltd., and W. H. Grinsted. 28,824. December 14th. (Divided application on No. 14,564 of 1912, June 21st.)

PORTABLE ELECTRIC LAMPS. S. Stern and The British Ever-Ready Electrical Co. 29,302. December 19th.

METHOD OF CHARGING CONDENSERS IN PARALLEL AND DISCHARGING THEM IN SERIES. Compagnie Générale Radiotélégraphique. 29,375. December 20th. (December 21st, 1911.)

1913.

ALARM DEVICE FOR ANNOUNCING FIRE AND BURGLARY. A. Bares and J. Weiss. 1,385. January 16th.

VENTILATION OF DYNAMO-ELECTRIC MACHINERY. Siemens Bros. Dynamo Works, Ltd., E. O. Kieffer and W. Parker. 3,224. February 7th.

PROCESS FOR THE PRODUCTION OF A BORON-TUNGSTEN COMPOUND. F. Hansen and W. F. Mohr. 3,525. February 11th. (Divided application on No. 9,941 of 1912, July 25th.)

MECHANICAL TYPE-PRINTING TELEGRAPHS, MAINLY APPLICABLE AS TOYS. F. C. Grasme. 4,665. February 24th.

ELECTRIC POCKET LAMP WITH COMPASS. Electromechanische Industrie Ges. 5,646. March 6th. (November 22nd, 1912.)